IMPACTS OF ATTITUDES AND PERSONALITY TRAITS ON WEIGHT GOALS AND WILLINGNESS TO PAY FOR A PERSONALISED NUTRITION PROGRAMME IN THAILAND

SCHOOL OF AGRICULTURE, POLICY AND DEVELOPMENT

THE UNIVERSITY OF READING

A thesis submitted to the University of Reading

in fulfilment of the requirements for the degree of Doctor of Philosophy

in Agricultural and Food Economics

Suwanna Sayruamyat

March 2018

Declaration

I confirm that this thesis is my own work and the use of all material from other sources has been properly and fully acknowledged.

Suwanna Sayruamyat

Certificate of Readiness to be included in Library

I grant powers of discretion to the University Librarian to allow this thesis to be copied in whole or in part without further reference to me. This permission covers only single copies made for study purposes, subject to normal conditions of acknowledgement.

Acknowledgements

To a great degree, there are many people who have supported me on the long path toward this PhD. I would like to express my deepest gratitude to my first supervisor, Associate Professor Giuseppe Nocella, for his constructive guidance, patience, understanding, care, and encouragement in every part while doing this research. I am also thankful to my second supervisor Professor Nikos Georgantzis for the time and effort that he has contributed to my research throughout the past three years. Without them, this thesis would never have been completed.

I would like to sincerely thank the Royal Thai Government for the scholarship supporting this work. Furthermore, I am also thankful to Kasetsart University and staff for supporting and assistant my doctoral study.

My heartfelt thanks go to my assistant researchers and all respondents who participated in this study for their kind and informative answers to the enormous questionnaire. Without them, this thesis would have never succeeded.

I would like to express my appreciation to my friends and my colleagues in the Department of Agricultural and Resource Economics, Kasetsart University, Thailand. They were always willing to help, give suggestions, cheer me up, and stand by me throughout this journey.

For enormous contributions toward this PhD thesis, I would like to acknowledge Dr Winai Nadee for support, guidance, experience sharing and proofreading my thesis.

Throughout my PhD life, I would like to thank my parents, my siblings and my aunt for their love, inspiration, encouragement, and best wishes for all time to achieve this doctoral study.

Dedication

This PhD thesis is dedicated to my parents, my siblings and my aunt for their endless love, support and encouragement.

Abstract

The international growth rate in the obesity epidemic has doubled since 1980 and this is an indication of poor lifestyles in many countries. The increase in obesity rates is not surprising when it happens in developed countries but when this increase appears rapidly and continuously in upper-middle income countries like Thailand it raises concerns about public health.

In order to eliminate the growth rate of obesity in the Thai population, it is important to understand not only the causes of increases in body weight but also to understand what significant determinants influence behaviour related to obesity. Accordingly, dieting is the most important and effective treatment to achieve weight goals. However, in some cases diets are considered a threat to dieters as dieting might have a negative impact on body weight, therefore rising obesity rates remains a severe public health concern despite the fact that the majority of people aim to lose weight. Personalised nutrition programmes may help policy makers, marketers and professionals to introduce dietary programmes to help people achieve their weight goals. This study presents an opportunity to enhance knowledge in the context of healthy dietary behaviours focusing on the aspect of economics and social psychology. In social research, the health-related behavioural study is an important approach to understanding cognitive determinants of health behaviours such as healthy eating and physical activity, while also being a way of exploring how these determinants influence and predict such behaviour.

This study aims to achieve three objectives: 1) to explore how attitudes, social norms, habits, risk attitudes, time preferences, socio-demographic and economic characteristics influence willingness to pay for a personalised nutrition programme proposed to reach weight goals; 2) to evaluate whether stated behaviour and WTP for the proposed PN programme is stable over time; 3) to assess how personality traits, time preferences, commitment, self-control, weight change and life satisfaction influence weight goal achievement.

The key findings showed that the Heckman sample selection model was an appropriate econometric model that represents all determinants from economic and psychological aspects via an expectancy value model to predict health behaviour. Thailand is a

potential market for Personalised Nutrition Programmes and such programmes should be a good starting point to improve the dietary habits of the Thai people. Goal commitment and self-control around eating behaviour are important inhibition facilitators to help participants stay focused when trying to achieve their weight goals.

Keywords: Expectancy value model, Attitudes, Time preferences, Willingness to pay, Personalised Nutrition Programme, Weight goal achievement

Table of Contents

Declaration i
Certificate of Readiness to be included in Library ii
Acknowledgements iii
Dedication iv
Abstract v
Table of Contents vii
List of Tables xi
List of Figures xiii
List of Acronyms xiv
CHAPTER 1 1
1.1 Background 1
1.2 Obesity prevalence in Thailand 3
1.3 Economic reasons of obesity 4
1.4 Factors influencing unhealthy dietary choices 6
1.4.1 Socio-demographic factors 6
1.4.2 Economic factors 9
1.4.3 Psychological factors 11
1) Attitudes 12
2) Social norms 13
3) Personality Traits 14
1.5 Predicting healthy eating behaviour via social cognition models 15
1.5.1 Measuring and definition health behaviour 16
1.5.2 Application of social cognition models in the context of obesity 26
1.5.3 Intention-behaviour gap 30
1.6 Weight goal achievement 31
1.7 Research gaps 35
1.8 Research questions, objectives and theoretical framework 39
1.10 Data collection 42
1.11 Thesis outline 43
CHAPTER 2 45
Abstract 45

2.1 Introduction....46
2.2 Methodology....52
2.2.1 Conceptual framework....52
2.2.2 Measurement of proximal and distal elements....54
2.2.3 Contingent valuation scenario for the proposed PNP and measurements....56
2.2.4 Econometric modelling of expectancy value models and WTP....56
2.3 Data collection....59
2.4 Results....60
2.4.1 Socio-economic characteristic of participants....60
2.4.2 Comparison of proximal and distal elements via ITT for PNP....60
2.4.3 Comparing results of one stage/two stage regression models....61
2.5 Discussion and conclusions....69
CHAPTER 3....74
Abstract....74
3.1 Introduction....75
3.2 Expectancy value model and stated behaviour....76
3.2.1 Theory of Trying....78
3.2.2 Intention stability....79
3.2.3 Predicting stated behaviour....80
3.2.4 Proposed distal elements predicting behaviour....81
3.3 Empirical study....82
3.4 Measurement of the elements of the TOT and modelling behavioural stability....84
3.4.1 Measurement of proximal elements....84
3.4.2 Measurement of distal elements....85
3.4.3 Modelling behavioural stability....86
3.5 Data collection....91
3.6 Empirical results....91
3.6.1 Socio-demographic and psychographic characteristic of participants....91
3.6.2 Overview of empirical study....92
3.6.3 Impacts of stability trying intention, proximal and distal constructs on WTP for PNP....94
3.7 Discussion and implication....98
3.8 Conclusion and future work....100

CHAPTER 4 102
Abstract 102
4.1 Introduction 103
4.2 Psychological components affecting body weight: a review 104
4.2.1 Time preferences, eating behaviours and body weight 104
4.2.2 Emotional eating behaviour 105
4.2.3 Reinforcement sensitivity theory in weight control 106
4.2.4 Self-efficacy in weight control 107
4.2.5 Satisfactions and achievement on weight control 107
4.2.6 Weight goal commitment 109
4.3 Methodology 110
4.3.1 Conceptual framework 110
4.3.2 Measurements of distal and proximal elements 111
1) Distal elements 111
2) Proximal elements 112
4.3.3 Measurements of weight control's outcome 113
4.3.4 Data analysis procedures 116
4.4 Data collection and Participants 117
4.5 Results 118
4.5.1 Identifying items for existing scales 118
4.5.2 Validity of existing scales and measurement model 119
4.5.3 Test of a structural model 119
4.5.4 The effects of preferences, personality and self-control on weight achievement 120
4.5.5 Discussion and Implications 123
4.6 Conclusion and future work 126
CHAPTER 5 127
5.1 Research summary 127
5.1.1 Problem definition 127
5.1.2 Research design 128
5.1.3 Proposing the modelling behaviour via expectancy value model 128
5.1.4 Identifying the relationship between satisfaction and achievement 130
5.2 Research contribution 132

5.2.1 Academic aspect....132
5.2.2 Practical aspect....132
1) Marketing....132
2) Policy recommendations....133
5.3 Limitation and future research....135
5.3.1 Data collection....135
5.3.2 Questionnaire....135
5.3.3 Individual differences....136
5.3.4 Econometric Model....136
REFERENCES....137
Appendix A Questionnaires....157
Appendix A.1 Questionnaire for phase 1....158
Appendix A.2 Questionnaire for phase 2....190
Appendix B Poster paper presented at EAAE 2017....208

List of Tables

Table 1.1	Application of social cognition models predicting health-related behaviour	19
Table 1.2	Research gaps identified with the literature review	37
Table 1.3	Identification of research questions and their answers by chapters	43
Table 2.1	Application of expectancy value model and contingent valuation survey (WTP)	48
Table 2.2	Summary statistics of proximal elements for intenders, non-intenders and total sample	61
Table 2.3	Summary statistics of distal elements for intenders and non-intenders	61
Table 2.4	Impact of proximal and distal elements of TOT on WTP for PNP: a comparison of results obtained with HHSM, DHM, TM and IR.	63
Table 2.5	Coefficient and marginal effects of proximal elements on ITT and WTP for PNP of the two-stage model	64
Table 2.6	Elements' coefficients of TOT on WTP for PNP of HSSM, DHM, TM and IR when replacing the missing value of WTP for PNP with zero	67
Table 2.7	WTP for PNP of two-stage regression models when including distal elements in stage 1 and proximal elements in stage 2	69
Table 3.1	Matrix of intention stability	92
Table 3.2	Marginal effects of proximal and distal elements of TOT on WTP for PNP	96
Table 3.3	Coefficients and marginal effects of proximal elements of TOT on intention to try PNP	97
Table 3.4	Probability of intention and means of expected WTP for PNP	98
Table 4.1	Hollenbeck et al (1989)'s goal commitment items	113
Table 4.2	The criteria for weight goal achievement of the first condition	114
Table 4.3	The criteria for weight goal achievement following the second condition	115

Table 4.4	The criteria for weight goal achievement following the hard condition	115
Table 4.5	The criteria for weight goal achievement following the progress condition	116
Table 4.6	Standardised direct effects of all variables in the model	121
Table 4.7	Standardised indirect effects of all variables in the model	122
Table 4.8	Standardised total effects of all variables in the model	122

List of Figures

Figure 1.1	Overweight and obesity prevalence in Thai adult population (≥18 years) in 2005, 2009 and 2014	4
Figure 1.2	Conceptual framework: psychological and economic factors influencing weight goals	41
Figure 2.1	Conceptual framework of modelling WTP via extended theory of trying	53
Figure 2.2	Frequency distribution of observed WTP	62
Figure 2.3	Distribution of expected WTP for PNP predicted by selected models	65
Figure 3.1	The theory of trying (Bagozzi and Warshaw, 1990)	79
Figure 3.2	Proximal and distal elements of the extended TOT framework	84
Figure 3.3	Comparision of stable ITT and untable ITT	92
Figure 3.4	Distribution of WTP for PNP	94
Figure 4.1	The path diagram of hypothesised relationships among time preferences, STP, RET, goal commitment, satisfaction and weight goal achievement	110
Figure 4.2	The revised path diagram with standardised regression weights for all significant statistical relationships.	120
Figure 4.3	Standardised regression weights between two different evaluations of weight achievement	122
Figure 5.1	Modelling WTP for PNP via extended theory of trying	129
Figure 5.2	Capturing the behaviour gap via expectancy value model	130
Figure 5.3	Path diagram for casual relation between satisfaction and achievement	131

List of Acronyms

Acronyms	Definition
ACH	Achievement/weight goal achievement
AP	Attitudes toward process
BAS	Behavioural Activation System
BIS	Behavioural Inhibition System
BMI	Body mass index
CDF	Cumulative distribution function
CFI	Comparative fit index
CSRD	Cross-sectional research design
CV	Contingent valuation
DHM	Double hurdle model
EAAE	The European Association of Argicultural Economicsts
EDU	Education
EMP	Employment
EVF	Expectancy value of failure
EVS	Expectancy value of success
FG	Filling the gap
GBP	British pound currency code
GC	Goal commitment
GFI	Goodness of fit index
GOF	Goodness-of-fit
HBM	Health belief model
HSSM	Heckman sample selection model
IR	Interval regression
ITT	Intention to try
LL	Log-likelihood
LRD	Longitudinal research design
MAD	Multi-attribute decision model
MLE	Maximum likelihood estimation
NCDs	Non-communicable diseases
NHS	National Health Service
NITT	no intention to try
OECD	The Organisation for Economic Cooperation and Development
OLS	Ordinary least square
PB	Past behaviour
PDF	Probability density function

Acronyms	Definition
PN	Personalised nutrition
PNP	Personalised nutrition programme
PT	Past trying
RET	Resistance to eating temptation
RISK	Risk attitudes
RMSEA	Root mean square of approximation
SAT	Satisfaction
SD	Standard deviation
SDT	Self-determination theory
SEM	Structural equation modelling
SEU	Subjective expected utility
SGG	The Sabater-Grande and Georgantzis's lottery panel test
SN	Social norms/subjective norms
SRE	Self-regulatory efficacy
STP	Sensitivity to punishment
STR	Sensitivity to reward
TGP	Theory of goal pursuit
THB	Thai baht currency code
TIME	Time preferences
TM	Tobit model
TOT	Theory of trying
TPB	Theory of planned behaviour
TRA	Theory of reasoned action
TSR	Theory of self-regulation
Wald	Wald chi-square test
WHO	World Health Organisation
WTP	Willingness to pay

CHAPTER 1

INTRODUCTION

This chapter will set the research context for the three papers presented in Chapters Two, Three, and Four where the determinants of trying to achieve weight goals will be explored from different angles of modelling conceptual frameworks of economics and social psychology. The starting sections of this introduction are an overview of the past and current international obesity situation (Section 1.1) with a focus on its prevalence in Thailand (Section 1.2) which is the country where this study was conducted. Section 1.3 highlights the economic reasons causing the obesity epidemic, while Section 1.4 reviews studies exploring how socio-demographic, economic and psychological factors affect obesity and diet behaviour. Section 1.5 focuses on studies employing social cognition models to predict healthy eating behaviour and physical activity. Section 1.6 highlights past findings of research conducted on weight goal achievement. Section 1.7 gathers research gaps identified in previous sections. Section 1.8 presents research questions linked to some of the research gaps presented in Section 1.7 together with the conceptual framework developed to achieve stated objectives. Finally, Section 1.9 outlines the structure of this PhD thesis.

1.1 Background

Overweight and obesity are the consequences of the surplus of body energy stores (energy intake over energy expenditure). Higher calorie intake has been correlated to food containing a higher quantity of fat and sugary sweetened beverages which provide 'empty' calories leading to lower nutrition intakes (Giskes *et al*., 2011). Since 1980 international statistics show that an increasing number of people around the world is becoming overweight and obese (WHO, 2016). The continuous international double growth of overweight and obesity as well as indicating poor quality of life is raising concern among politicians because obesity is becoming an epidemic and is affecting adults, the elderly and also children in developed and less developed countries. The rise of obesity prevalence is caused by unhealthy diets and lack of physical activity, which can lead to several non-communicable diseases (NCDs) such as cancer, diabetes, cardiovascular disease, high blood pressure, and premature loss of life (WHO, 2015). In 2014, 39% of the world adult population (18 years and older) was overweight (1.9

billion) and 13% obese (600 million). The percentage of overweight men and women was nearly the same (38% men and 40% women).

In 2015, the highest adult obesity rates in OECD countries were observed in the United States (38.2%), Mexico (32.4%), New Zealand (30.7%) and Hungary (30%) and the United Kingdom (26.9%). In contrast, the lowest adult obesity rates were observed in Japan (3.7%), Korea (5.3%), India (5%), Indonesia (5.7%) and China (7%) and Italy (9.8%) (OECD, 2017). OECD forecasts that the threshold of obesity population will continually increase by more than 30% in the United States, Mexico, and England until 2030 (ibid.). Moreover, the World Obesity Federation (2017) forecast that in 2025, 2.7 billion adults worldwide will suffer from overweight and obesity, and the annual global medical bill for treatments of obesity will consequently be up to US$1.2 trillion per year.

At a macroeconomic level, different patterns of obesity can be explained by the different degree of economic development between developed and less developed countries. According to Philipson and Posner (2003), technological changes were the cause of long-run growth in obesity prevalence. They argue that economic growth increases the number of sedentary jobs, which negatively affect consumers' lifestyle in terms of dietary habits, physical activity and leisure time. As a result, obesity becomes a problem especially for the poor (McLaren, 2007). This indicates that a higher level of economic development has a positive relationship with obesity prevalence, which could imply that an economic crisis may reduce the number of overweight and obese people. For example, during the economic crisis in Cuba from 1989 to 2000, adult Cubans increased the proportion of physical activity by 37% and decreased per capita daily energy intake by 37.5%. As a result, the crisis decreased the prevalence of obesity by 7% and also declined deaths from diabetes, coronary heart diseases, stroke and other health causes (Franco *et al*., 2007). Furthermore, after the economic recovery, it was observed in Cuba that from 2005 to 2009 the rise of food availability and energy intake per capita caused an increase in mortality from heart diseases and type-2 diabetes (National Vital Statistics, 2009). The positive effect of the economic crisis on the reduction of obesity was also confirmed by (Kleanthous et al., 2016). They found that the number of overweight and obese children declined during the Greek economic crisis between November 2009 and May 2012. These findings present a challenge to

economists and politicians who wish to sustain the stability of economic growth and reduce obesity simultaneously.

The growth of obesity in developed countries is not a surprise, but the rapid and continuous increase of people affected by this disease in upper-middle income countries such as China and Thailand is difficult to understand (Pitayatienanan *et al*., 2014). This means that also these countries will need to reserve public funds to tackle obesity and other NCDs. For high-income countries such as the United Kingdom, the cost of these diseases was estimated to be over £6-billion per year, and are projected to reach £10-billion per year by 2050 (Butland *et al*., 2007). Indeed, the real costs are likely to be higher because the estimation ignored the investment in staff training and specialist equipment such as beds, chairs and operating tables to support obese patients (Steer, 2016). However, for a upper-middle income country like Thailand, politicians will be struggling to cope with public health costs which seem to have been rising rapidly during the last year (Pitayatienanan *et al*., 2014).

1.2 Obesity prevalence in Thailand

In Thailand, the progressive increase in obesity prevalence has raised public concern (Sawadmongkol, 2015; Pittayarangsalitta, 2016). According to Thumrungsi (2014), in 2014 37.5% of the Thai population aged 18 years and over was overweight[1] and 10.9% was obese (Figure 1.1). In Thailand women (26.1%) are more overweight than men (19.7%). This proportion is similar to the global obese population as women (9.8%) are also more obese than men (5.0%) (WHO, 2016). As shown in Figure 1.1, the Bureau of International Health reports that the growth rate of overweight among Thai adults sharply increased from 2005 to 2009 and slightly increased between 2009 and 2014, while the growth of obesity has steadily increased since 2005 (Pittayarangsalitta, 2016). This change stresses that Thailand also has to tackle the social and economic burden caused by nearly half of its adults being overweight and obese. Obesity not only significantly influences the quality of life, but also decreases productivity and increases healthcare costs directly (Sun and Empie, 2007; Pitayatienanan *et al*., 2014). In

[1] The identification of weight classification follows the Body Mass Index (BMI) criteria of the Centres for Disease Control and Prevention, the United States.

Thailand, the economic impact of overweight and obesity was estimated as THB12.1 billion in 2009 accounting for 0.13% of Thailand's Gross Domestic Product (GDP) (GBP 227.35 million: 53.40 Baht = 1GBP) (Pitayatienanan *et al*., 2014; Thumrungsi, 2014). It is clear that policy makers must address the problem of overweight and obesity in Thailand immediately and also understand the economic reasons for the obesity epidemic, which is not only for Thailand but also for all countries around the world.

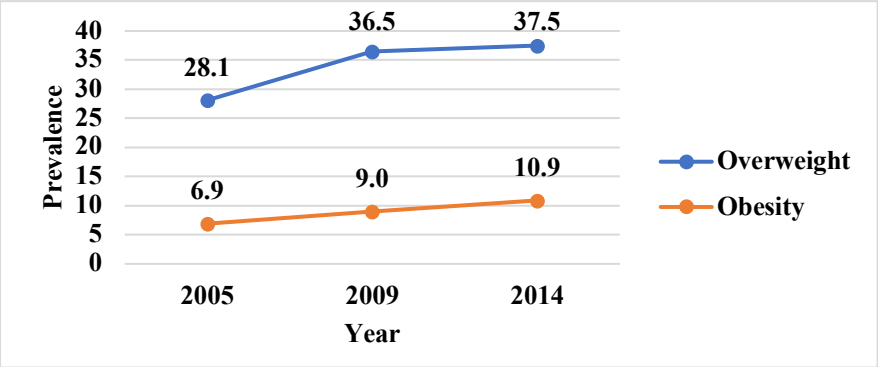


Figure 1.1 Overweight and obesity prevalence in Thai adult population (≥18 years) in 2005, 2009 and 2014

The next section will discuss the causes of obesity based on an economic perspective. It will explore how economic reasons can help to understand why overweight people and obesity have dramatically increased.

1.3 Economic reasons of obesity

From an economic point of view, one of the most important questions to tackle obesity is to understand why a person becomes obese when markets do not perfectly work. According to neoclassical economics, markets fail when they cannot follow conditions for the optimal operations of a competitive market. These conditions are: an infinite number of buyers and sellers, free entry and free exit from the market, homogeneity of products, perfect information for all economic agents and no externalities. For example, all costs of producing a commodity are borne by the producer and all the benefits of a commodity accrue to the consumer (Mazzocchi *et al*., 2009).

In the context of obesity, markets fail due to questions of imperfect information, lack of competition and externality. In the case of imperfect information, misleading

information and information asymmetry can cause an obesity epidemic. For example, misleading information caused by intensive and aggressive advertising on behalf of international food companies (e.g. Coca-Cola, KFC, McDonald and so on.) and nutritional information not supported by science may mislead consumers when they make their food choices. For consumers, it can be challenging to tease out reputable versus misleading nutrition information that supports the growth of high-energy food and drink industry (Bellows *et al*., 2014). Unfair and misleading advertising strategies have been tempting consumers toward unhealthy eating and short-term enjoyment of promotions such as 'buy one get one free' (Romero and Biswas, 2016). These marketing tools threaten individuals' self-control because people are not capable of controlling their weight and fail to achieve their weight loss (Naylor *et al*., 2009). Information failure can also be determined by information asymmetry when sellers have more information than buyers and might not have economic incentives to disclose information about unhealthy food. Moreover, health information is possibly more likely to be misused in a food market (Just and Payne, 2009). For instance, food products often display in bold letters such as "no trans-fats" or "no sugar added" to show the best health attribute of the product but do not mention any negative attributes. Imbalanced information power between stakeholders and consumers regarding production and process control of food can increase obesity especially among children (Giammattei *et al*., 2003; Andreyeva *et al*., 2011). In the case of information failure, limited financial and time resources faced by individuals when shopping may force them to make poor food choices and, as a result, have a low quality diet (Darmon and Drewnowski, 2008).

The market for food is extremely competitive and fragmented and thus is unlikely to observe a situation of market power. However, if a monopoly firm conquers the market, the food choice for the consumer will be limited even though it optimises the cost of production. Lack of competition can lead to market failure because market power (monopoly or oligopoly) can reduce consumer choices and product substitutability although it is unlikely that a mature market like food can have this kind of problem (Mazzocchi *et al*., 2009; Finkelstein and Strombotne, 2010)

Externalities are probably the most important reason of market failure in the context of obesity. This happens because obesity generates health care costs which are paid by people who were not responsible for the wrong food choices made by obese people. Karnani *et al*. (2016) noted that the social costs of obesity over private cost could

represent the negative externality of the food market. For instance, in the USA, public health insurance such as Medicare and Medicaid provide coverage for medical expenses of obese people, while private health insurance policies charge an additional premium for obese people. Likewise, in the UK, obesity and related diseases cost the National Health Service (NHS) more than GBP 5 billion every year, and non-obese people mainly contribute to this cost (Waitzman, 2015). Moreover, international trade could also generate negative externalities. When goods exchanged under World Trade Organisation policies create positive externalities because liberalisation provides more availability of cheap foods in the market, over-consumption of unhealthy food impacts negatively on population health determining negative externalities (Ruckert and Labonté, 2014).

Consumers make unhealthy food choices which can lead them to become obese and to increase the risk of developing other NCDs in the long run. Several factors seem to influence their choices and thus these contribute to the generation of the world obesity epidemic (Mazzocchi *et al*., 2009; Finkelstein and Strombotne, 2010).

1.4 Factors influencing unhealthy dietary choices

Several factors influence consumers' choice of unhealthy food products which together with aspects of sedentary lifestyle such as watching television too long, lack of physical activity and lack of sleep, are the causes of a dramatic increase in the obesity epidemic and premature deaths (Hill and Peters, 1998; Marti *et al*., 2004; Stroebele and de Castro, 2004). Scientific publications and commentaries are released continuously to motivate people to change their lifestyles to reduce the risk of becoming obese (Ludwig *et al*., 2001; Vartanian *et al*., 2007; Basu *et al*., 2013). However, to understand the obesity epidemic better it is necessary to look at how socio-demographic, economic and psychological factors influence unhealthy dietary choices (Sun and Empie, 2007)

1.4.1 Socio-demographic factors

Empirical research shows that sociodemographic factors such as gender, age, and ethnicity influence dietary behaviour and obesity (Hu, 2008). As regards gender, adult women are becoming the target of obesity research because the percentage of overweight and obese women is higher than men in many countries around the world. Furthermore, findings of a positive association with obesity for women were more

consistent than those for men who do not have a consistent positive association with obesity (McLaren, 2007). For example, Hintsanen *et al*. (2012) found that men had a positive association with obesity, while some studies found that men had a negative association with BMI (Sutin *et al*., 2011; Sutin *et al*., 2015b). However, Sutin and Terracciano (2015) did not find any relationship between gender and obesity. It implies that social research and policy tools to counteract obesity should be applied equally to men and women as the growth rate of obesity of the adult male population is nearly the same as that of adult women in several countries (e.g. France, Spain, Czech Republic, Iceland and the UK) (OECD, 2017).

In the case of age, according to the report of WHO (2016), obesity not only occurs in every part of the world but also occurs in every period of life stages. A person's body weight increases from birth, and the relationship is positive but not linear (McLaren *et al*., 2003; Rossi *et al*., 2011; Sutin *et al*., 2011; Avsar *et al*., 2017). Rossi *et al.* (2011) found a negative quadratic relationship between age and Body Mass Index (BMI) across the successive cohort. Their finding is useful to explain that an increase of BMI depends on an individual's age when using cross-sectional data to analyse the relationship between age and obesity among participants, and this is also consistent with the findings of Sutin *et al*. (2011).

Education is another essential socio-demographic predictor of obesity and often is used to indicate knowledge about diet and nutrition. Social perception of fatness and thinness seems to be influenced by a higher level of education. Some studies report that highly educated women tend to favour the pursuit of thinness and tend to be more dissatisfied when their weight increases (McLaren *et al*., 2003; McLaren and Kuh, 2004). In contrast, Hall *et al*. (2003) found that energy intake may not be related to education level, and some studies in different countries indicate positive association between higher education level and obesity in both men and women (Macdonald *et al*., 1997; McLaren, 2007; Martín *et al*., 2008). These findings emphasise that education is a mechanism to transfer knowledge that promotes a healthy diet and prevents weight gain.

Marriage is a fundamental social status and plays a crucial role in many people's life. Marital status contributes to better health outcomes and increases life expectancy (Wood *et al*., 2007; Manfredini *et al*., 2017). However, as regards obesity, many couples tend to gain weight after entering marriage because the contentment of living

together can influence more regular eating habits (Averett *et al*., 2008). Previous research shows a positive association between marriage and obesity and negative association when people are divorced or unmarried (Sobal *et al*., 1992; Jeffery and Rick, 2002; Wilson, 2012; Teachman, 2016). However, these results are not reliable when considering gender as a moderator. For example, Sobal *et al*. (1992) found that married men were fatter than unmarried men, but their model did not confirm this relationship for women. Teachman (2016) suggested that other factors such as race or ethnicity should be taken into account for observed marital status and gender to explain differences in obesity.

Ethnicity is used to represent a cultural influence on obesity as shown in social studies conducted in the USA (Davis *et al*., 2004b; Kirby *et al*., 2012). Kirby *et al*. (2012) found that participants who lived in a highly Hispanic community had positive associations with BMI, whereas participants who lived in a largely non-Hispanic Asian community had the opposite associations with BMI. Curb and Marcus (1991) provided a case study to analyse the interaction between genes responsible for obesity and environmental factors. They found that Japanese immigrants in California who adopted more western behaviours had a higher risk of obesity than Japanese people in Japan. In the United Kingdom, Tyrrell *et al*. (2017) found that the modern obesogenic environment such as sedentary time, screen watching, western diet, consuming fizzy-drinks, and lack of physical activity interact with genes, leading to increased body weight. It is clear that the cultural context in which people live can influence obesity.

According to Mazzocchi *et al*. (2009), cultural aspects related to the different level of individualism and market freedom could explain cross-country differences in obesity. Low levels of obesity can be found in countries with low levels of individualism and a higher level of regulations such as Japan, Korea and Italy, while the opposite pattern is observed in Anglo-Saxon countries. Furthermore, different cultures shape different values, attitudes, and belief about physical appearance and lifestyles that provide different interpretations between their own weight and others. For example, since women in most cultures are judged on their physical appearance, they are more concerned than men about their body shape. Craig *et al*. (1996) found that in traditional Polynesian societies people believe that larger body size represents healthiness and attractiveness, while the opposite is true in Australia and Australian women therefore

desire a smaller body size. This is one reason to explain why Polynesians are more obese than Australians.

1.4.2 Economic factors

Among economic factors, food prices, income, and employment influence consumers' food choices and as a result have an impact on obesity. Increase in obesity rate is a direct outcome of decrease in relative food prices that promote overconsumption (Finkelstein and Strombotne, 2010; Cawley, 2011; Ruhm, 2012) and increase the demand for unhealthy food products such ready-to-eat products (Andreyeva *et al*., 2010). This is possible because advance in food technology can produce mass ready-to-eat food to feed millions of people who are attracted by these products because this technological change reduces the time cost of food consumption (Philipson and Posner, 2003; Ruhm, 2012). For example, microwavable foods, available in every convenience store, can reduce the time of preparing and cooking at home and also the time cost of unplanned eating. However even if the cost of food preparation has declined, the continuous increase in the average obesity rate since the mid-1990s indicates that there might be a positive relationship between ready-to-eat products and obesity (Burke and Heiland, 2007).

According to Cawley (2011), in the United States from 1950 to 2007 real food prices of unhealthy food products such as snacks, soft drinks and take away food decreased by 38%. It becomes an incentive for people who cannot afford expensive food but in this way can consume high-calorie and tasty foods. In contrast, real prices of lower-calorie and nutritious foods such as fruits and vegetables have been increasing since the 1980s (Christian and Rashad, 2009). During the same period, statistics show that the number of overweight Americans has risen by around 4%, while the number of obese Americans has risen by 15% (Mazzocchi *et al*., 2009). The relationship between food prices and obesity is also examined in some studies regarding overeating and high-calorie intake (Monsivais *et al*., 2010; Ruhm, 2012).

Although declining prices for food seems a reasonable explanation for the prevalence of obesity because this leads to an increase in overall food consumption, the decrease in real food prices may not, in fact, lead to a rise in obesity rates when one takes into consideration the price elasticity of demand for food. Price elasticity provides the percentage change in the quantity of purchase by 1% change in the price of purchase

and Mazzocchi *et al*. (2009) noted that the overall food price elasticity in developed countries such as the United Kingdom and the United States during 1967 to 2007 was close to zero. This means that people did not have a response to a change in real food prices. Capacci and Mazzocchi (2011) found that the average own-price elasticity for foods in the United Kingdom was relatively inelastic as similar as the findings of Lechene (2000). Moreover, they found that own-price elasticity for fruits was higher for a household which was in the lowest income group, and this is also consistent with the findings of Bertail and Caillavet (2008). This indicates that income is another key economic factor influencing the demand for healthy foods.

Income is broadly considered to be a powerful social predictor. It represents the quantity and quality of access to both monetary and non-monetary resources provided by society and it reflects the inequitable distribution of society shape influencing consumers' behaviours and their health related to obesity (Raphael, 2011; Ruckert and Labonté, 2014). Income is also a predictor of food purchasing behaviour and, as a consequence, of obesity because it has a direct influence on individual consumers' decision making and their ability to purchase healthy products (Godfray *et al*., 2010). Mendez *et al*. (2004) claimed that income was a stronger influence on obesity for Jamaican adults than metabolic disorders. Zhang and Wang (2004) found that the higher the income is, the lower the risk of obesity and the lower an individual's BMI. This implies that the burden of obesity shifts toward the poor, and also stresses that income is the main cause of the socioeconomic inequality which is driving the obesity epidemic (Zhang and Wang, 2004; Monteiro *et al.*, 2007; Ljungvall and Gerdtham, 2010). People who earn a higher income have the advantage of consuming alternative and expensive healthier foods and they therefore increase the demand for healthy products. Some people, however, gain weight because of an overconsumption of high energy foods, regardless of the level of income (Cawley, 2011), and an increase in income may not help them to make healthier food choices. Schmeiser (2009) found that additional income for a low-class family in the United States was associated with weight gain in women and their obesity prevalence was increased by 23-29%; whereas the weight of men was not affected.

Employment and working conditions are the origin of wealth and social determinants of health (Ruckert and Labonté, 2014). These factors provide financial security, social status, personal development, and health-promoting attributes reflecting the quality of

life (Marmot *et al*., 2008). Martín *et al*. (2008) reported that in Spain, obesity prevalence was more common among the retired and those who work at home than other professionals. Additional working hours also cause workers to become overweight or obese because of a decrease in exercise, an increase in fast-food consumption and reduced sleep (Courtemanche, 2009). Moreover, employment factors do not only contribute to obesity in adulthood but they also influence childhood obesity levels. Many research studies have found evidence to support the theory that maternal employment is a cause of obesity in children. For example, Anderson et al. (2003b) found that children with working mothers are 35% more likely to be obese than children without working mothers. Cawley and Liu (2012) propose that this is because working mothers have less time to spend grocery shopping, cooking and eating with their children, and they are more likely to buy prepared foods. Children of working mothers are also more likely to consume more snacks and bigger meals, while they are away from the home environment, and thus, according to Courtemanche (2009), the more extended the working hours of the mother, the more likely it is that her children will be overweight.

Another aspect of the relationship between employment and obesity is the fact that obesity is an undermining health condition that may relate to discrimination in the workplace (Rothblum *et al*., 1990). Several studies show that obesity has a negative effect on employment, which is far greater for women than for men (Rothblum *et al*., 1990; Morris, 2006; Morris, 2007; Puhl and Heuer, 2009)., and obese employees are more likely to be unemployed (Garcia and Quintana-Domeque, 2006). These findings show the complexity of trying to find a clear cause-effect relationship between employment and obesity, while also hinting at how difficult it can be for obese individuals to escape the trap of unemployment.

1.4.3 Psychological factors

Psychological circumstances of individuals can also cause obesity and thus much research focuses on exploring when and why overeating occurs. Psychologists focus on how individual factors such as attitudes, feelings, beliefs, personality traits and the pressure of the social environment (e.g. family, friends and peer influence) can influence eating behaviour. As a result, this section will focus on how these factors influence unhealthy eating behaviours and physical inactivity.

1) Attitudes

Attitudes are possible causes of obesity that can explain behavioural patterns of unhealthy diets and less physical activity. Fishbein and Ajzen (2010) claimed that attitude constructs can be used to understand and predict any behaviour of interest, even though the behaviour may be complex. Economists consider attitudes towards risk and time dimensions to evaluate an individual's preferences when considering risk and uncertainty, and the time value of money.

Risk attitudes are individuals' responses to uncertain perceptions and to their sensitivity of obesity risk and these attitudes vary according to different situations and different domains (Weber, 2010). According to the theory of decision-making (Mas-Colell *et al*., 1995; Lusk and Coble, 2005), most recent studies linked risk attitudes of the monetary domain with health behaviour and health outcomes (Anderson and Mellor, 2008; Ruggeri and Van Der Pol, 2012; Warshawsky-Livne *et al*., 2012). For example, Warshawsky-Livne *et al*. (2012) used two standard gambles to examine the relationship between monetary-risk attitudes (monetary gamble) and health-risk attitudes (life years' gamble). Their results suggest that risk attitudes elicited via financial aspects can predict sensitivity to health risk and health outcomes. Several scholars found that a person who is less risk averse has more potential to be overweight and obese than a person who is higher risk averse (Ikeda *et al*., 2010; Sutter *et al*., 2013; de Oliveira *et al*., 2015). Moreover, from the literature review, risk-seeking people seem not to invest in health goods and services to reduce the obesity risk for their longevity compared to risk-averse people. However, risk-averse people may decrease their spending on health products or services if these products or services are not effective (Dardanoni and Wagstaff, 1990; Picone *et al*., 2004).

Time preferences can help to explain why people decide to invest in a health service or to consume a healthy/unhealthy product. Time preferences are paramount to understanding the trade-offs that people will make between short-term gratifications for unhealthy eating and long-term benefits for health, and, as such, they can explain and predict health behaviours and outcomes like the risk of becoming obese (Heshmat, 2006; Leonard *et al*., 2013; Courtemanche *et al*., 2015; de Oliveira *et al*., 2015). People who score high on time preferences tend to be impatient with long-term health benefits. Impatient people are likely to enjoy and choose unhealthy food products for

consumption, overlooking the negative consequences of obesity on health (Heshmat, 2006; Zhang and Rashad, 2008; Courtemanche *et al.*, 2015).

Komlos *et al.* (2004: p217) noted that "telling people to change their diets and exercise more may not suffice to alter their behaviour in the long run if their marginal rate of time preference does not decline at the same time". Changing behaviour by motivation schemes may be useless if external factors still challenge an individual's patience toward overconsumption. Leonard *et al.* (2013) explained that some impatient people might increase their awareness and concern about food choices to lose weight for future health benefits, but they may ignore possibly both immediate and future costs (i.e. the impact on their future health and/or likelihood of obesity). Courtemanche *et al.* (2015) claimed that the opportunity for lower cost food consumption is an incentive to gain weight for impatient individuals, while this not the case for patient people. People with high time preference rates (impatient people) are more sensitive to economic factors such as food prices and food availability which are a threat to overeating and obesity. It is clear that time preferences are a reasonable and stable variable to represent an individual impatience that explains why some people become overweight or obese.

2) Social norms

Social norms (SN) are another factor which can induce obesity growth and can lead to the failure of weight management interventions (Bahr *et al.*, 2009). From a longitudinal data set of 32 years collected by the Framingham Heart Study Social Network, Christakis and Fowler (2007) found that social ties are relevant to the spread of obesity from person to person caused by biological and behavioural factors. These findings are consistent with the simulation of Bahr *et al.* (2009), who reported that if an obese person was surrounded by friends having a lower BMI, healthier diet and more physical activities, then together they would tend to have a lower weight. On the other hand, if people are surrounded by friends having a high BMI, they would gain more weight. Moreover, their findings showed that in the long-term losing weight with friends of friends was more effective than losing weight with only close friends. It is difficult to select friends who are of normal-weight and avoid making friends who are overweight or obese. Another social pressure is the body shape of celebrities in films, television, business, politics and so on. Such images may encourage people to be more aware of their own body image and therefore more concerned with becoming overweight or obese (Bahr *et al*., 2009). These studies indicate that research on obesity should take

social pressure into account seriously and explore how this psychological factor can be used to change unhealthy eating behaviour. To change the unhealthy behaviour of people, the alteration of social norms may be driven by the use of social media to motivate unhealthy people to do more exercise if they want to be effective and reverse the negative trend of the obesity epidemic (Fowler and Christakis, 2008; Bahr *et al*., 2009).

3) Personality Traits

Personality is involved in an individual's susceptibility to obesity and in the failure of dieters to reach weight loss goals (Sullivan *et al.*, 2007). Certain personality traits are identified by several dominant factors such as sociability, conscientiousness, self-esteem, emotional stability, hostility and independence, and personality traits are more resistant to changes compared to attitudes (Ajzen, 2005). Personality is not the only influence on BMI and obesity as eating-related behaviours, physical activity and sedentary behaviour also increase the risk of weight gain over time (Heaven *et al*., 2001; Wilson and Dishman, 2015; Sutin and Terracciano, 2017).

The relationship between personality and BMI/obesity is both positive and negative, depending on its traits. This is confirmed by several models of personality traits such as the Five-Factor model (McCrae and Costa Jr, 1999; Davis *et al*., 2007; Jokela *et al*., 2013; Sutin *et al*., 2015a; Sutin and Terracciano, 2017), the Eysenck Personality Inventory model (Davis *et al*., 1993; Korkeila *et al*., 1998; Faith *et al*., 2001), and the Big Five Inventory model (John and Srivastava, 1999; Sutin and Terracciano, 2015). The reinforcement sensitivity theory of personality proposed by Gray (1970) is also widely used to describe dietary habits, unbalanced eating and eating disorder related to obesity (Torrubia *et al*., 2001; Davis and Woodside, 2002). This personality theory concentrates on a motivational system that explains the controlling system of eating behaviour (Franken and Muris, 2005; Davis and Fox, 2008). The first system is the Behavioural Inhibition System (BIS) related to sensitivity to punishment (STP) and the second is the Behavioural Activation System (BAS) related to sensitivity to reward (STR) (Torrubia *et al*., 2001).

For the reward and motivation systems, people take action for rewarding outcomes or avoiding outcomes if it would be unpleasant. Food is one of the most popular rewards for people, and this aspect can lead to overeating. According to Davis *et al.* (2007),

STR has a positive relationship in predicting overeating habits similar to women's food preferences for sweet and fatty foods. Davis and Fox (2008) found a quadratic relationship between BMI and STR. STR was moderately positive when the BMI was less than 30, and the direction was inverse when the BMI was over 30. These results were corroborated by Dietrich *et al.* (2014) who also found that the association between BMI and BAS varied in gender as similar as the association between BMI and BIS. In women, BMI was positively associated with both BAS and BIS, while for men this association was negative especially for those showing lower STP and stronger emotional and cognitive control over punishment situations (Cross *et al*., 2011). This evidence explains why people become obese via personality traits, and why women have a higher risk of obesity than men.

For individuals, there are several internal and external psychological factors, which can make it difficult for people to control their diet and BMI. A class of social psychological models have attempted to demonstrate how these factors can be modelled to explain healthy or unhealthy eating behaviour. This class of models is known as expectancy value models, and psychologists and economists have used these theories to predict or explain healthy behaviours in order to improve intervention schemes (Sutton, 2004; Finch *et al*., 2005). As a result, the next section will focus on theoretical aspects and methodological issues of expectancy value models used to explain and predict health behaviour in the context of obesity.

1.5 Predicting healthy eating behaviour via social cognition models

Social cognition models attempt to predict behaviour that can be explained by crucial cognition determinants and by their relationships with the way in which these models regulate behaviour (Armitage and Conner, 2000; Conner and Norman, 2005). Table 1.1 shows a list of selected studies where social researchers have used these models to explore different behaviours such as smoking, physical activity, sexual activity, drinking, buying healthy products and dieting. Out of the 53 studies selected in table 1.1, only four were conducted in China, India, Indonesia and South Korea (Kim and Park, 2012; Prabawanti et al., 2015; Su et al., 2015; Paul et al., 2016), while the rest were conducted in developed countries (24 in Europe, 23 in North America and 8 in Australia). They use primary data or national surveys, and the average sample size is

540 (*s* =705). Research also use different social cognition models where cross-sectional and between individuals designs appear to be the dominant choice to develop these studies.

Social researchers apply these models to predict healthy or unhealthy behaviours related to obesity such as consuming fruits and vegetables, drinking sugary beverages, drinking alcohol, intention to change diet and so on (Armitage and Conner, 1999; Conner et al., 1999; Conner et al., 2002; Silva et al., 2010; Stadler et al., 2010; Ajzen et al., 2011; Dunn et al., 2011; Carfora et al., 2016; Lash et al., 2016; Riebl et al., 2016). These behaviours are shaped by multiple factors (i.e. biological, psychological and social factors) which are incorporated in these conceptual frameworks in different ways and where cognitive determinants are assumed to be the core proximal elements of the behaviour. There are several social cognition models such as the health belief model, protection motivation theory, social cognitive theory, the theory of reasoned action, the theory of planned behaviour, and the theory of trying, (Armitage and Conner, 2000; Sutton, 2004). One of the most challenging theoretical aspects of these models is the selection and evaluation of the behavioural criterion (Fishbein and Ajzen, 2010). Therefore, before reviewing studies where researchers have applied these models in the context of obesity, the next section will discuss methodological issues of measuring of behaviour.

1.5.1 Measuring and definition health behaviour

The measurement of a certain behaviour is the key point of social cognition theories of health behaviour. Fishbein and Ajzen (2010) noted that measuring the behaviour criterion of a single behaviour of interest (i.e. eating apples or drinking orange juice) is easily observed, but it is impossible to conduct direct observations for a behavioural category such as eating fruits or drinking sugary beverages. This is the reason why most social research use self-reports rather than direct observation. Investigators can simply ask to recall past behaviours of participants by assessing a category via self-report. Self-report measurements are widely used because they recall past behaviour, which is framed under volitional control to remove environment hurdle. There are different ways to measure behaviour related obesity. The simple way of self-reporting is to use binary scales (Yes/No) to see whether people are willing to perform the behaviour of interest, i.e. if someone eats five portions of fruits and vegetables every day. Frequency scales may be used to see how often this behaviour is performed since last week, which may

use a verbal scale ranging from never too many times. Continuous scales can be used to evaluate the magnitude of the behaviour if researchers are interested in how much participants pay to perform a certain behaviour, e.g. consuming five portions a day of fruits and vegetables. Sometimes researchers also elicit information about the number of times that a specific behaviour is performed and then use these numbers to create an index of healthy or unhealthy eating behaviour (Sutton, 2004). However, some behaviours cannot be predicted well if people lack knowledge, skills, opportunities or resources to perform a certain behaviour. This can happen when, for example, the payment for a new technology that helps people to lose weight is costly, or if the market does not have the technology yet.

Another challenge is to make sure that all participants understand the same definition and their definition matches with the investigator because behaviours related to obesity are complex (Sutton, 2004; Fishbein and Ajzen, 2010). Behaviour should be defined according to four components: target, action, context, and time (Sutton, 2004; Fishbein and Ajzen, 2010; Vogel and Wanke, 2016). For example, purchasing (action) fruits (target) at a convenient store (context) in the last month (time). Sometimes these elements of behaviour seem ambiguous, and their identification depends on the link between the research aim and behavioural criterion (Fishbein and Ajzen, 2010). However, it importantly notes that those four elements will predict behaviour better when taking into account the principles of aggregation and correspondence (Fishbein and Ajzen, 2010; Vogel and Wanke, 2016). Multiple statements should be used to measure normal behaviour and need clear the situations between specific or general level. Moreover, these measures should be matched concerning action, target, context and time at the same level of specificity or generality.

Behaviours measured employing these conceptual frameworks are shaped by multiple factors such as psychological, social and biological factors. Factors incorporated into these conceptual frameworks are measured in different ways, and psychological and cognitive determinants are assumed to be the core proximal elements of the behaviour because it is assumed that they directly cause behaviour. The other factors are considered distal elements that are further expected to influence such behaviour, which is more stable compared with proximal elements (Lämmle *et al.*, 2013). A class of these social cognition conceptual frameworks assesses behaviour via expectancy value models. Expectancy value models are the contribution of beliefs to overall attitudes

represented by the feature of multiplication between belief strength and outcome evaluation (Ajzen and Fishbein, 2008). The next section will review how expectancy value models such as health belief model, protection motivation theory, social cognitive theory, the theory of reasoned action (TRA), the theory of planned behaviour (TPB) and the theory of trying (TOT) have been used to evaluate health behaviour in the context of obesity. Most psychological research on health behaviour related to obesity uses the theories of health behaviour to tackle questions, i.e. Why do people engage in healthy diet while others do not? Why are people diffident on how often they do exercise? The answers to these questions lead to an explanation and understanding of the variation of between-individual factors on such behaviours, which are the key of interest to academic research and practitioners, i.e. marketers. On the other hand, research in health behaviour related obesity rarely attempts to address the question, i.e. Why does a person's eating behaviour change over time or across different situations? This question is also important to understand how determinants of within-individual variation influence the variation of such behaviours. Despite the fact that all the relevant theories could explain in detail at the between-individual level but some theories describe health behaviours related to obesity via static models, most studies specify a causal relationship between determinants and behaviour from cross-sectional data to explain a dynamic sense by assuming the acceptance of the hypothesised causal model. Accordingly, this approach needs other strong assumptions in statistic estimation (Sutton, 2004). However, the causal lag should be considered to take the change in within-individual factors into account for behavioural stability. As a result, longitudinal research design appears more appropriate than cross-sectional research design for understanding health behaviour especially in the context of obesity. Importantly, this type of research design can investigate the variation of within-individual factors in such behaviour and also facilitate the mixed research design that seems rarely conducted in this field (Sutton, 2004) (see Table 1.1).

Table 1.1 Application of social cognition models predicting health-related behaviour

No	Authors: Title	Aims of study	Research design	Data collection	Sample size / Country	Method of sampling	Psychological conceptual framework	Type of data analysis
1	Bagozzi and Warshaw (1990): Trying to consume	To propose TOT model indicating how goals are important in the consumer behaviour	Between-individual / Longitudinal	Questionnaires	264 students, / Canada	Convenience	TGP, TPB and TOT	Hierarchical regression, logit analyses, and structural equation modelling
2	Conner *et al*. (1996): Dieting in adolescence: An application of TPB	To examine the relationship between intention to diet and self-reported dieting behaviour	Between-individual / Cross-sectional	Questionnaires	231 students / UK	Convenience	TPB	Stepwise multiple regression
3	Hedeker *et al*. (1996): Estimating individual influences of behavioural intentions: An application of random-effects modelling to TRA	To propose a random effects regression model for estimating the degree to which relations among variables vary at the individual level	Mixed / Longitudinal	Questionnaires	1002 Students / USA	Simple random	TRA	Random-effects regression
4	DeHart and Birkimer (1997): Trying to practice safer sex: Development of the sexual risks scale	To validate the construct of TOT for condom use to predict intention to practice safer sex	Between-individual / Cross-sectional	Questionnaires	496 students / USA	Convenience	TOT	Structural equation modelling
5	Bagozzi and Edwards (1998): Goal setting and goal pursuit in the regulation of body weight	To investigate the self-regulation of body weight goal	Between-individual / Longitudinal	Questionnaires	117 students / USA	Convenience	TSR	Structural equation modelling
6	Armitage and Conner (1999): Distinguishing perceptions of control from self-efficacy: predicting consumption of a low-fat diet using the theory of planned behavior	To apply TPB predicting low-fat diet, considering differences between self-efficacy and perceived control, examining self-identify to TPB and identifying beliefs	Between-individual / Cross-sectional	Questionnaires	221 students / UK	Convenience	TPB	Correlation, factor analysis and regression analysis
7	Conner *et al*. (1999): Alcohol consumption and TPB: An examination of the cognitive mediation of past behaviour	To examine the predictive power of TPB explaining alcohol consumption	Between-individual / Cross-sectional	Questionnaires	513 students / UK	Convenience	TPB	Multiple regression

No	Authors: Title	Aims of study	Research design	Data collection	Sample size / Country	Method of sampling	Psychological conceptual framework	Type of data analysis
8	Conner *et al*. (2002): TPB and healthy eating	To examine the power of TPB predicting healthy eating intention and behaviour in a long-term	Mixed / Longitudinal	Questionnaires	144 patients / UK	Judgement	TPB	Hierarchical regression
9	Baker *et al*. (2003): Predicting adolescent eating and activity behaviours: the role of social norms and personal agency	To examine predictors of eating behaviour and physical activity in adolescents	Between-individual / Longitudinal	Questionnaires	279 students / USA	Convenience	TPB	Structural equation modelling
10	Armitage (2004): Evidence that implementation intentions reduce dietary fat intake: a randomised trial	To evaluate the effectiveness of an intervention for reducing dietary fat intake	Mixed / Longitudinal	Observations, questionnaires	264 adults / UK	Judgement	TPB	Mixed multivariate analysis of variance
11	Nejad *et al*. (2004): Predicting dieting behaviour by using, modifying, and extending TPB	To examine factors determining weight-loss dieting among female	Between-individual / Longitudinal	Questionnaires	373 students / Australia	Convenience	TPB	Independent-t-test, Path analysis
12	Nejad *et al*. (2005): Comparison of the health belief model and TPB in the prediction of dieting and fasting behaviour	To compare HBM and TPB predicting two weight-loss behaviours	Between-individual / Longitudinal	Questionnaires	373 students / Australia	Convenience	TPB, HBM	Hierarchical regression, path analysis
13	Honkanen *et al*. (2006): Ethical values and motives driving organic food choice	To examine the relationship between ethical food choice motives and attitudes toward organic food	Between-individual / Cross-sectional	Questionnaires, survey	1603 adults / Norway	Convenience	TRA	Structural equation modelling
14	Cooke *et al.* (2007): Predicting binge-drinking behaviour using an extended TPB: Examining the impact of anticipated regret and descriptive norms	To investigate the utility of extended TPB in predicting binge-drinking intention and behaviour	Between-individual / longitudinal	Questionnaires	178 students	Convenience	TPB	Hierarchical regression
15	Arvola *et al*. (2008) Predicting intentions to purchase organic food: The role of effective and moral attitudes in TPB	To predict the purchase intention of organic foods by integrating measures of effective and moral attitudes into TPB model	Between-individual / Cross-sectional	Questionnaires, face-to-face interviews	672 adults / Italy, Finland and UK	Stratified random and quota	TPB	Structural equation modelling
16	Blanchard *et al*. (2009): Do ethnicity and gender matter when using TPB to understand	To examine the utility of TPB for understanding 5-A-Day intentions and behaviour and the	Between-individual / longitudinal	Questionnaires	413 students / USA	Convenience	TPB	Structural equation modelling

No	Authors: Title	Aims of study	Research design	Data collection	Sample size / Country	Method of sampling	Psychological conceptual framework	Type of data analysis
	fruit and vegetable consumption?	TPB relationship moderated by ethnicity or gender						
17	Vassallo *et al*. (2009): Willingness to use functional bread. Applying HBM across four European countries	To predict willingness to use functional bread	Between-individual / Cross-sectional	Questionnaires	2094 adults / UK, Italy, Germany, Finland	Quota	HBM	ANOVA, Linear regression
18	Andrews *et al*. (2010): Parents as health promoters: A TPB perspective on the prevention of childhood obesity	To understand the factors impacting the attitudes and behaviours of parents relating to providing healthy foods and limiting unhealthy foods	Between-individual / Cross-sectional	Questionnaires	201 adults / USA	Convenience	TPB	Structural equation modelling
19	Buglar *et al*. (2010): The role of self-efficacy in dental patients' brushing and flossing: testing an extended HBM	To understand the beliefs underlying brushing and flossing self-care	Between-individual / Cross-sectional	Questionnaires	92 adults / Australia	Convenience	HBM	Hierarchical regression
20	De Bruijn (2010): Understanding college students' fruit consumption. Integrating habit strength in TPB	To understand the fruit consumption in college students	Between-individual / Cross-sectional	Questionnaires	538 students / Netherlands	Convenience	TPB	Stepwise regression
21	Silva *et al*. (2010): Using SDT to promote physical activity and weight control: a randomised controlled trial in women	To investigate the 1-year impact of an SDT-based intervention	Between-individual / longitudinal	Observation, Questionnaires	239 adults / Portugal	Convenience	SDT	Independent samples t-test
22	Stadler *et al*. (2010): Intervention Effects of Information and Self-Regulation on Eating Fruits and Vegetables Over Two Years	To test whether an intervention that combined information with self-regulation strategies had a better effect on eating fruits and vegetables than an information-only intervention	Between-individual / longitudinal	Observation, Questionnaires	255 adults / Germany	Random	SRE	Independent sample t-test
23	Zimmermann and Sieverding (2010): Young adults' social drinking as explained by an augmented TPB: The roles of prototypes, willingness, and gender	To explain young adults; social drinking and to investigate risky occasional drinking	Between-individual / Longitudinal	Questionnaires	300 adults / Germany	Convenience	TPB	Structural equation modelling
24	Ajzen *et al*. (2011): Knowledge and the prediction of behaviour:	To examine the relationship between knowledge and	Between-individual / Cross-sectional	Questionnaires	332 students / USA	Convenience	TPB	Hierarchical regression

No	Authors: Title	Aims of study	Research design	Data collection	Sample size / Country	Method of sampling	Psychological conceptual framework	Type of data analysis
	The role of information accuracy in TPB	behaviour in three domains: environment, drinking alcohol, and Islam and Muslims						
25	Dunn *et al*. (2011): Determinants of fast-food consumption. An application of TPB	To examine the predictors of fast-food consumption	Between-individual / Cross-sectional	Questionnaires	404 adults / Australian	Random	TPB	Structural equation modelling
26	Hee and Jae-Eun (2011): Consumer purchase intention for organic personal care products	To examine the effects of values and past experiences on consumer purchase intention of organic personal care products	Between-individual / Cross-sectional	Questionnaires	207 adults / USA	Quota	TPB	Hierarchical regression
27	Norman (2011): TPB and binge drinking among undergraduate students: Assessing the impact of habit strength	To predict binge drinking intentions and behaviour and test whether habit strength explaining additional variance in binge drinking behaviour	Between-individual / Longitudinal	Questionnaires	137 students / UK	Convenience	TPB	Hierarchical regression
28	Dean *et al*. (2012): The role of self-identity, past behaviour, and their interaction in predicting intention to purchase fresh and processed organic food	To understand the processes involved in consumer decision making on the purchase and consumption of processed and fresh organic foods.	Between-individual / Cross-sectional	Questionnaires	499 adults / UK	Random	TPB	Hierarchical regression
29	Emanuel *et al*. (2012): TPB explains gender difference in fruit and vegetable consumption	To examine gender differences in fruit and vegetable intake	Between-individual / Cross-sectional	Questionnaires	3309 adults / USA	Secondary from national survey	TPB	Structural equation modelling
30	French and Cooke (2012): Using TPB to understand binge drinking: The importance of beliefs for developing interventions	To elicit students' salient beliefs about binge drinking	Between-individual / Longitudinal	Questionnaires	181 students / UK	Convenience	TPB	Linear regression
31	Kim and Park (2012): Development of a health information technology acceptance model using consumers' health behaviour intention	To develop and test a model describing the behavioural intention and the health behaviour of consumers of various health information technologies	Between-individual / Cross-sectional	Questionnaires	728 adults / South Korea	Convenience	TPB, HBM, TAM	Structural equation modelling
32	Kothe *et al*. (2012): Promoting fruit and vegetable consumption:	To evaluate the efficacy of TPB based intervention to increase fruit and vegetable consumption	Mixed / Longitudinal	Questionnaires	194 students / Australia	Convenience	TPB	Structural equation modelling

No	Authors: Title	Aims of study	Research design	Data collection	Sample size / Country	Method of sampling	Psychological conceptual framework	Type of data analysis
	Testing an intervention based on the TPB							
33	Zoellner *et al*. (2012): Qualitative application of the TPB to understand beverage consumption behaviours among adults	To investigate cultural cognitions related to beverage consumption	Between-individual / Cross-sectional	Questionnaires, focus groups	75 adults / USA	Homogeneous	TPB	Hybrid deductive, inductive qualitative analysis
34	Dowd and Burke (2013): The influence of ethical values and food choice motivations on intentions to purchase sustainably sourced foods	To predict the intention to purchase sustainably sourced food by a three-step adaption of TPB	Between-individual / Cross-sectional	Questionnaires	137 adults / Australia	Snowball	TPB	Hierarchical regression
35	Kim *et al*. (2013): Anticipated emotion in consumers' intentions to select eco-friendly restaurants: Augmenting the TPB	To examine the relationship between the determinants and describe consumer's acceptance and engagement in ecological behaviour	Between-individual / Cross-sectional	Questionnaires	411 students / USA	Convenience	TPB	Structural equation modelling
36	Fleming *et al*. (2014): Using the theory of planned behaviour to examine pharmacists' intention to utilise a prescription drug monitoring program database	To explore the utility of TPB predicting Texas pharmacists' intention to utilise an online accessible PDMP	Between-individual / Cross-sectional	Questionnaires, survey	998 adults / USA	Judgement	TPB	Multivariate, hierarchical logistic regression
37	Kroshus *et al*. (2014): Understanding concussion reporting using a model based on TPB	To predict the concussive symptom underreporting among late adolescent	Between-individual / Cross-sectional	Questionnaires, survey	256 students / USA	Judgement	TPB	Structural equation modelling
38	O'connor et al. (2014): Factors that influence young people's mental health help-seeking behaviour: a study based on HBM	To specify key determinants and moderators of help-seeking intention	Between-individual / Cross-sectional	Questionnaires	180 students / Australia	Convenience	HBM	Hierarchical regression
39	Mullan *et al*. (2015): Examining the predictive utility of an extended TPB in the context of specific individual safe food-handling	To examine the predictors of safe-food handling behaviours via extended TPB	Between-individual / Longitudinal	Questionnaires	170 students / Australia	Convenience	TPB	Hierarchical regression

No	Authors: Title	Aims of study	Research design	Data collection	Sample size / Country	Method of sampling	Psychological conceptual framework	Type of data analysis
40	Prabawanti *et al*. (2015): A survey on HIV-related health-seeking behaviours among transgender individuals in Jakarta, based on TPB	To map the psychological determinants of four HIV-related health-seeking behaviours	Between-individual / Cross-sectional	Interview, Questionnaires	209 adults / Indonesia	Cluster	TPB	Logistic regression
41	Su et al. (2015): Smoking behaviours and intentions among adolescents in rural China: The application of TPB and the role of social influence	To examine the association between cognition and smoking behaviour and intentions	Between-individual / Cross-sectional	Questionnaires	2609 students / China	Convenience	TPB	Logistic regression
42	Tomasone *et al*. (2015): Intentions and trait self-control predict fruit and vegetable consumption during the transition to the first-year university	To examine the independent and combined effects of TPB variables and self-control predicting the consumption of fruit and vegetable	Between-individual / Longitudinal	Questionnaires	76 students / Canada	Convenience	TPB	Hierarchical regression
43	Carfora *et al*. (2016): The role of self-identity in predicting fruit and vegetable intake	To predict intention and behaviour about fruit and vegetable intake	Between-individual / Longitudinal	Questionnaire	210 students / UK	Convenience	TPB	Structural equation modelling
44	Conner *et al*. (2016): Basis of intentions as a moderator of the intention–health behaviour relationship	To examine the moderating effect of intention based on attitudes and norms for health behaviour	Within-individual / Longitudinal	Questionnaires	366 adults / UK	Convenience	TPB	Multilevel modelling
45	Dowd *et al*. (2016): Psychosocial predictors of changes in adolescent girls' physical activity and dietary behaviours over the course of the Go Girls! Group-Based mentoring program	To examine the determinants predicting changes in physical activity and dietary behaviour	Mixed / Longitudinal	Questionnaires	310 students / Canada	Convenience	SRE	Intra-class correlation, Multilevel path analysis
46	Guan *et al*. (2016): Incorporating communication into TPB to predict condom use among African American Women	To study the influence of communication-related variables on condom use intention and via extended TPB	Between-individual / Longitudinal	Questionnaires	560 adults / USA	Convenience	TPB	Structural equation modelling
47	Jun and Arendt (2016): Understanding healthy eating behaviours at casual dining	To examine the effects of psychological factors on healthy	Between-individual / Cross-sectional	Questionnaires	744 adults / USA	Judgement	TPB	Structural equation modelling

No	Authors: Title	Aims of study	Research design	Data collection	Sample size / Country	Method of sampling	Psychological conceptual framework	Type of data analysis
	restaurants using the extended TPB	eating behaviours of customers via extended TPB						
48	Lash *et al*. (2016): Can the TPB predict dietary intention and future dieting in an ethnically diverse sample of overweight and obese veterans attending medical clinics?	To predict dietary intention and future dieting	Mixed / Longitudinal	Questionnaires	84 adults / USA	Judgement	TPB	Paired sample t-test, Hierarchical regression
49	Newham *et al*. (2016): Intentions toward physical activity and resting behaviour in pregnant women: Using TPB framework in a cross-sectional study	To identify the factors influencing physical activity and resting behaviour in pregnant women	Between-individual / Cross-sectional	Questionnaires	345 adults / UK	Convenience	TPB	Linear hierarchical regression
50	Paul *et al*. (2016): Predicting green product consumption using TPB and TRA	To extend TPB predicting Indian consumer's green product purchase intention	Between-individual / Cross-sectional	Interview, questionnaires	521 adults / India	Quota	TRA, TPB	Structural equation modelling
51	Riebl *et al*. (2016): Beverage choices of adolescents and their parents using TPB: a mixed methods analysis	To evaluate the effectiveness of TPB in understanding and predicting adolescents' and parents' sugary drink consumption	Between-individual / Longitudinal	Questionnaires	102 students / USA	Convenience	TPB	Stepwise multiple regression
52	Vassallo *et al*. (2016): Investigating psychosocial determinants in influencing sustainable food consumption in Italy	To investigate the determinants of consumer decision-making towards sustainable foods	Between-individual / Cross-sectional	Questionnaires	3004 adults / Italy	Multi-stage: quota, random and stratified	TPB	Structural equation modelling
53	Bong Ko *et al*. (2017): Predictors of purchase intention toward green apparel products: A cross-cultural investigation in the USA and China	To understand consumers' purchase intention toward green apparel product in China and the USA	Between-individual / Cross-sectional	Questionnaires	428 students / China and USA	Convenience	TPB	Structural equation modelling

Note: HBM is the health belief model. MAD is the multi-attribute decision model. SDT is the self-determination theory. SEU is the subjective expected utility. SRE is the self-regulatory efficacy. TRA is the theory of reasoned action. TGP is the theory of goal pursuit. TOT is the theory of trying. TPB is the theory of planned behaviour. TSR is the theory of self-regulation.

1.5.2 Application of social cognition models in the context of obesity

Many studies have applied expectancy value models to evaluate how attitudes and other psychological constructs influence or predict behaviours related to obesity (Trafimow and Finlay, 1996; Bagozzi and Edwards, 1998; Armitage and Conner, 2000; Sutton, 2004; McEachan *et al*., 2011; Lash *et al*., 2016). As regards the Theory of Reasoned Action (TRA), this model postulates that the best predictor of behaviour is the behavioural intention, which is determined by attitude and subjective norms towards the behaviour. Social researchers have applied the TRA to explain and predict behaviours of interest (e.g. eating and physical activity) leading to obesity. The study conducted by Sejwacz *et al*. (1980) seems to be the first to apply TRA to predict and understand weight loss through the measurement of two behaviours: linked to dieting physical activities. They found that only dieting behaviour influenced weight loss, while physical activity did not. However, it should recognise that losing weight is not a behaviour but a goal that can be reached by performing behavioural actions correlated with dieting or exercising (Fishbein and Ajzen, 2010). Thus TRA can be considered a starting model for adapting and expanding knowledge to deal with weight goal measurement (Bagozzi and Warshaw, 1990). Although TRA can be applied in situations concerning individual ability to achieve weight loss intention, this model is limited to distinguish goal intentions from behavioural intentions (Sheppard *et al*., 1988). Owing to this issue between behaviours and goals, the Theory of Planned Behaviour (TPB) proposed by Ajzen (1991) extends TRA by adding a new element named perceived behavioural control. Perceived behaviour control is similar to self-efficacy as introduced by Bandura et al. (1977) and represents personal beliefs about the difficulty of performing the behaviour of interest. TPB differs from TRA because it provides an outstanding framework to conceptualise, and it measures and identifies proximal influence understanding health behaviours related to obesity (Glanz *et al*., 2008). Armitage and Conner (2001) performed meta-analysis reviewing 85 studies and found that TPB could account for 27% of the variance in behaviour, which was less than behavioural intention by 12%. They also revealed that TPB accounted for more variance in behaviour (11%) when measures were self-reported instead of observed measures. This indicates that using self-report measures constructs of TPB will provide more efficient prediction in the behaviour of interest, which is appropriate to apply to this thesis. This meta-analysis also shows that most scholars use cross-sectional

research designs to predict eating and physical behaviour via TRA or TPB models. Longitudinal studies seem are conducted rarely because of conditions relating to time and budget and Hedeker *et al*. (1996) seem to be the first scholars to develop a longitudinal TRA study to estimate cognitions and behavioural intentions in relation to smoke to eat healthy food and to exercise. This research team used a random-effects regression model to analyse within-individual factors, i.e. cognitions and behaviour explaining individual weights.

Other longitudinal studies have instead employed the TPB model. For example, Conner *et al*. (2002) used TPB to predict healthy eating intentions and behaviour by following participants' attendance at clinics over six-years. They found that the TPB model could explain well intentions over time but not the impact of perceived past behaviour on intention. Their findings imply that past behaviour may not be a good predictor of intention and behaviour in the long-run of a follow-up period, which contrasts what Hagger *et al*. (2002) and McEachan *et al*. (2011) reported in their studies. However, Conner *et al*. (2002) also found a positive interaction between intention and intention stability in predicting healthy eating behaviour for six years. This means that intention stability will be an interesting predictor of behaviour in longitudinal studies when explaining the gap between intention and behaviour.

Armitage (2004) used TPB to evaluate intentions to reduce dietary fat intake in the UK population employing an effective intervention based on the concept of implementation to make plans for the behaviour change intervention. He conducted a randomised controlled design to compare both dietary intake of the experimental group with the control group (between-individual factors) and dietary intake at baseline to follow-up for investigating within-individual factor. Findings show that implementation intention of reducing dietary fat intake was an important intervention factor to reduce dietary fat intake for a month period. His findings stress that intention is the key factor, which may lead to success in dietary control and weight intervention.

McEachan *et al*. (2011) conducted a meta-analysis over hundred articles with the scope to explore the efficacy of TPB on physical activity and diet behaviours. McEachan *et al*. (2011) distinguished between adults, student and adolescent samples and found that adults were more driven by rational considerations but less driven by affective associations, impulsivity and direct social pressure than adolescents because of their more well-developed control function. These findings imply that attitudes are more

important than social norms in predicting the behaviour of adults. They also found that perceived behavioural controls were significant predictors of physical activity and dietary behaviour compared with other health behaviours (e.g. safer sex) and social norms were the strongest predictor of risk behaviour. Moreover, past behaviour played an important role in the prediction of physical activity by 19% of an additional variance, which is consistent with the meta-analysis of Hagger *et al*. (2002). This evidence challenges TRA and TPB models to take into account past behaviour when predicting behaviour. Even though McEachan *et al*. (2011) did not find any significant difference between the length of a follow-up eating behaviour; there were significant differences regarding physical activity behaviour. In this case, shorter follow-up periods seem to be better than longer periods especially for the relationship between social norms, intention and behaviour.

Dowd *et al*. (2016) applied TPB using self-regulation efficacy as perceived behavioural control to predict changes in physical activity and dietary behaviours during a seven-week period among adolescent girls in Canada. They found that changes in self-regulatory efficacy and intention directly predicted changes in both behaviours. Moreover, they also found an indirect effect of attitudes on physical activity behaviour, which was mediated by intentions, whereas they did not find an impact on dietary behaviour. Recent research has applied TPB to predict current and future dietary intention of overweight and obese military veterans who attended medical clinics in the USA (Lash *et al*., 2016). They added 'perceived need' and 'anticipated regret' constructs to the standard TPB model. Their results showed that TPB was useful to predict dietary intention but challenging to help participants to improve their dietary behaviour. Anticipated regret significantly improved the ability of standard TPB to predict dietary intention, while perceived need did not. Owing to the fact that they focussed on a small sample of 84 males over three-months, their findings may not explain and predict a complex behaviour perfectly. This is because it is difficult to predict a sustainable change such as trying to lose weight by dieting control within three months. In a nutshell, there is no study, which applies the theory of trying with mixed or within-individual research design to obtain the cognitions and trying behaviour related to obesity over time. In the next section, the theory of trying will be discussed.

However, neither TRA nor TPB consider the probability of failing to achieve an intended weight goal, especially when the certain behaviour is considered in terms of

monetary values (Shepperd *et al*., 1998). For example, when people wish to try a health service that is not available on the market to reduce their weight and their willingness to pay for these services is not taken into account, it is difficult to understand from stated behaviour if they can afford it. Even if they cannot afford, they can ask for a personal loan. But there is no guarantee that their loan applications will be accepted.

In the context of losing weight, there are various hurdles to reduce the probability of trying to achieve this goal, such as satisfaction with current eating behaviour, lack of knowledge about nutrition, the uncertainty of weight control outcomes, the transaction cost of attending weight interventions and so on. Another obstacle is trying not to try, i.e. when a decision engages with several forms of self-denial such as deferred gratification and self-expression of being obese (Gould *et al*., 1997). To tackle issues related to behaviour mediated by goals, Bagozzi and Edwards (1998) proposed an attitude theory exploring the relationship between attitude and behaviour related to a goal and prediction of goal outcomes (Gollwitzer and Brandstätter, 1997). This is based on the idea that attitudes, beliefs and behaviours can minimise threats of losing personal control (Hart *et al*., 2009; Chaxel, 2016). In addition, different psychological models were applied to explore the power of attitudes on intention toward performing a certain behaviour (Sheppard *et al*., 1988; Ajzen, 1991). "Intention" is a significant moderator of decision making and "trying" to lose weight is the necessary process to achieve the established weight goal. To explore this idea, Bagozzi and Warshaw (1990) expanded the Fishbein model (Ajzen and Fishbein, 1980) to explain goal-directed behaviours and proposed the Theory of Trying (TOT).

The TOT is a conceptual framework which stresses the intention stage to investigate an intermediate behavioural goal. Bagozzi and Yi (1989) found that intention had a stronger correlation with trying to reach a goal than with actual goal achievement. Moreover, Bagozzi and Warshaw (1990) argued that the TRA should include other variables to determine intention when shifting from a reasoned action to a goal. Thus, they proposed the TOT to explain the gap between decisions and action stages of consumer behaviour and in their seminal work focussed on the evaluation of trying to lose weight.

The proximal elements of the TOT (attitudes, subjective norms, past and recent habits) are expressed as a consequence of trying leading to weight goal achievement. For example, attitudes captured three elements: the attitude toward trying and succeeding,

the attitude toward trying and failing, and the attitude toward the process of trying to lose weight. In this way, attitudes could indicate dynamic explanations of feeling about efforts and outcomes linked to an individual weight goal (Bagozzi *et al*., 2004). Moreover, the TOT can indicate an allocation of consumers' weight loss efforts by using the multiplicative function of expectancy (Bagozzi *et al*., 2003). For example, if people strongly believe in trying the new technology for losing weight then there will be a higher possibility that their belief will lead to expectation toward success in adopting the new technology. On the other hand, if they score high on attitudes toward failure, their belief will lead to rejecting the adoption of the new technology. This conceptual framework also differs from other expectancy value models because it takes past behaviour (PB) into account. Bagozzi and Warshaw (1990) argued that past trying should be considered as a predictor of intention toward trying to lose weight because attitudes are self-generated and influence behaviour partially. When individuals feel unclear about their intention to achieve their weight goals, the frequency of past trying helps to decide on trying and taking actions as people will actually perform their actions based on their past behaviour (Davis and Warshaw, 1992).

1.5.3 Intention-behaviour gap

Despite the fact that intention is considered as a factor to predict health behaviour, many people fail to transform their intention into an action (e.g. losing weight, reducing drinking sweetened beverage, doing more exercise and so on). In the context of obesity, the stability of intention is a critical factor in the gap between intention and behaviour, which is the most challenging aspect of capturing when employing social cognition models. Although TRA and TPB models are widely used to understand and predict health behaviour, especially dietary behaviour in intervention studies, the intention-behaviour gap is hugely explored by researchers as highlighted by Hackman and Knowlden (2014) in their systematic review. For example, it observed that dietary interventions change the eating behaviour of adolescents only in the very short run, but they may not succeed in the long-term (Mann *et al*., 2007). According to Rhodes and Bruijn (2013) meta-analysis, several studies show that only half of intenders could succeed to perform their intended physical activity to achieve a certain goal. These findings indicate that intention to perform the physical activity during intervention programmes is a weak predictor of goal achievement. A few studies have attempted to explore the intention-behaviour gap and results are not consistent. For example,

contrasting results emerged from studies that measured intention stability from within-participants scores assessed by multiple statements between two-time points (Bagozzi and Yi, 1992; Sheeran *et al*., 1999; Conner and Godin, 2007). (Bagozzi and Yi, 1992; Sheeran *et al*., 1999; Conner and Godin, 2007). Bagozzi and Yi (1989) did not find any influence of intention stability on behaviour, while Sheeran *et al*. (1999) found that stability of intention was a strong determinant of behaviours. Their results are consistent with findings of Conner and Godin (2007) who used eight databases to assess different health behaviours. Conner and Godin (2007) also found that the degree of intention stability also depends on the period between two time points, i.e. the longer the period, the higher is the failure between stated and observed behaviour. This happens because long periods increase the probability of new events that may cause a change in intention to achieve a goal (e.g. losing weight) making stated intentions unstable over time (Sutton, 1998). Additionally, people easily ignore their intention and regularly mention that they just forgot about it (Sheeran *et al*., 1999).

1.6 Weight goal achievement

To reduce the international growth rate of overweight and obesity observed during the past four decades, both scientists and social researchers have attempted to identify the causes and determinants of increasing body weight. Scientific studies focus on the outcomes of macronutrients that are the primary nutritional components of diets contributing to body weight (Messier *et al*., 2004; Clifton *et al*., 2008; Brinkworth *et al*., 2009). Dieting is the most important and useful treatment to achieve weight goal. However, dieting is not the only factor affecting the body weight, and in some cases diets are the threat to dieters. Mann *et al*. (2007) emphasise the importance of health-related behavioural research to understand cognitive determinants of health behaviours and explore how these determinants influence and predict behaviours.

Despite the fact that the majority of people try to lose weight mainly as everyday behaviour, the growth of overweight and obesity remains a severe public health problem (Williamson *et al*., 1992). Mann *et al*. (2007) claimed that many dieters regain weight within 3-5 years later, and between one third and to two third of dieters regain more weight than they lost. Dieting alone does not sustain weight loss in the long-term. McGuire *et al*. (1999) denoted that failure of weight loss and weight regain are responsible for the failure to continue healthy behaviour changes. These findings

indicate that weight goals (loss and maintaining) are very challenging and many people fail to achieve them (Jeffrey *et al*., 1998; Mann *et al*., 2007). Several studies conducted on weight goals focused only on participants who joined a weight loss intervention programmes (Jeffrey *et al*., 1998; Linde *et al*., 2004; Provencher *et al*., 2007). Other studies instead explored weight-loss goals of overweight and obese people administering surveys (Williamson *et al*., 1992; Anderson *et al*., 2003a; De Vet *et al*., 2013). However, it appears that there are no studies exploring weight goals of individuals trying to maintain or gain their weight (see Table 1.1).

Past studies show that an individual's establishment of a weight goal is a significant starting point towards the achievement of their weight goal. This is consistent with the goal setting theory proposed by Locke and Latham (2002) who found a linear association between goals, effort, and performance. When goals are difficult to achieve individuals make a greater effort towards higher performance, especially when they are strongly committed (Klein *et al*., 1999). Intention to achieve a certain goal can be enhanced when people are committed (Fishbein and Ajzen (2010). For example, the effectiveness of an intention to lose weight can be increased by making an explicit commitment to weight goal because this will increase the probability of performing the stated behaviour (e.g. eating more fruits and vegetables and doing more exercise). In this case, commitment towards a choice will be influenced by personal and interpersonal pressures which will push individuals to behave consistently with their commitment (Cialdini, 2001). Determined people will set more challenging goals and make a constant effort to reach such goals (Locke and Latham, 2002). It is clear that goal commitment is the key success factor of goal achievement because it reflects people's self-efficacy and consistency.

Furthermore, not many studies have investigated the relationship between weight loss goals and weight achievement. For example, Jeffrey *et al*. (1998) reported that weight loss goals did not predict short and long-term weight losses successfully. Linde *et al*. (2004) found a weak correlation between weight loss goals and weight outcomes. These studies only observed overweight and obese patients who were willing to participate in the experiment and were asked to set their weight goals that in some cases were not realistic (e.g. losing 20 kg in one month). However, Jeffrey *et al*. (1998) showed that people who succeeded to achieve weight goals had a better long-term performance than those who failed. When people understand, after trying to lose weight for a while, that

this is a difficult task, initial weight goals can also be readapted (Linde *et al*., 2004). Fabricatore *et al*. (2007) reported that remarkable weight losses on behalf of obese people could be explained by strong intention and strong desire to achieve a weight goal. Moreover, overweight and obese individuals always set weight goals beyond the recommendations that this will take more effort to be achieved (Fabricatore *et al*., 2008). According to De Vet *et al*. (2013), psychological factors such as commitment, self-concordance and age have a strong and positive relationship with weight goal settings. Their results corroborate a positive association between goal trying, goal setting and goal commitment that are essential determinants of achieved weight goals (Williams *et al*., 1996). However, so far it seems that scanty research has been conducted to explore how psychological factors and other relevant factors such as socio-demographic and economic characteristics of individuals can influence weight goals achievement.

As is widely known, many overweight and obese people try to fight against weight gain with healthy eating and physical activity, but they fail to sustain these behaviours in the long term (Mann *et al*., 2007; Arens and Hamilton, 2016). Scientific research has also proved that changing environment not only promotes over consumption but also affects genetic susceptibility to obesity (Tyrrell *et al*., 2017). Tyrrell *et al*. (2017) analysing genetic data of British adults found that high-risk obesogenic environments and behaviours which are determined by socio-economic position, sedentary time, western diet, fried-food consumption and so on can accentuate a genetic susceptibility to a higher BMI. This implies that global public health schemes tackling the obesity epidemic may have lower impacts than programmes dealing directly with individuals. The use of these programmes could also help individuals to achieve weight goals, but to date, no research has been conducted to explore whether the possibility of using new technology can affect goal achievement.

In this respect, nutrigenomics[2] could help policy makers, marketers and professionals to introduce dietary programmes helping people to achieve weight goals. This scientific discipline could become of great importance to citizens in combatting chronic diseases

[2] Nutrigenomics as a scientific discipline encompasses the application of genomic research to nutrition. Nutrigenomics attempts to understand how food and nutrients influence gene expression, protein expression and metabolic production, and thus tries to understand how nutrition influences human physiology (Komduur, R. H., Korthals, M. & Te Molder, H. (2008). The good life: living for health and a life without risks? On a prominent script of nutrigenomics. *British Journal of Nutrition,* **101**, 307-316.

but specifically, obesity, because it allows the food industry to provide personalised nutrition on the market (Ferguson and Philpott, 2005). Individuals who are overweight and obese have a higher degree of disease susceptibility, and as a result, personalised nutrition (PN) could prevent diseases that are associated with obesity. The adoption of specific diets may prevent diseases that will be exposed sooner or later (Joost *et al*., 2007).

From this point of view the EU project "Food4me" provides insights on how nutrigenomics offers the possibility to design a healthier and more individual diet on the basis of a better understanding of the relationship between food and genes.[3] In this project, researchers integrated a study of opportunities and challenges PN to design PN (Food4Me, 2011). This technology will be more efficient to individuals if advice regarding PN will be provided via social marketing campaigns (Fallaize *et al*., 2013; San-Cristobal *et al*., 2015). For example, Celis-Morales *et al*. (2016) revealed that internet-delivered intervention was an appropriate approach to promote PN to change dietary behaviour among European adults.

In future, personalised nutrition, which can be considered an application of nutrigenomics, will have the potential to offer consumers individualised dietary interventions to reduce their disease susceptibility (Stewart-Knox *et al*., 2008). The food industry can take advantage of these new market opportunities to create *ad hoc* food products, which can facilitate consumers to make sustainable and healthy food choices. San-Cristobal *et al*. (2015) found that following a healthy diet is not enough to prevent overweight and obesity, while PN can help consumers in achieving their weight loss goals, which are considered difficult to reach and maintain.

So far, in social science research, the concept of PN has been only explored in relation to consumer acceptance and willingness to pay. For example, Poínhos *et al*. (2014) surveyed in nine European countries and found that significant psychological factors such as perceived risks and benefits, self-efficacy and perceived efficacy control and regulation can influence consumers' acceptance of PN. Moreover, Fischer *et al*. (2016) reported that in eight European countries 30% of participants were willing to pay up to

[3] A detailed discussion about nutrigenomics and personalised nutrition is beyond the scope of this thesis. For more information on this topic see the website of the EU project Food4me (http://www.food4me.org).

150% more than a conventional dietary programme where PN was not included. Their findings imply that dietary programmes including PN are desirable and should be combined with the health care plans for consumers.

In the light of topics and findings discussed so far, the development of a market scenario based on the idea of proposing to Thai consumers to try a PN programme to achieve weight goals fits very well in the context of this study. Research gaps highlighted in this review are shown in the next section.

1.7 Research gaps

Table 1.2 presents the research gaps highlighted with this literature review. As can be observed from the rows and columns of Table 1.2, the research area related to the topic investigated in this study presents plenty of opportunities to enhance knowledge in the context of healthy dietary behaviours when working on aspects of economics and social psychology. The blank cells represent areas of future research. For example, Table 1.2 shows that there is a lack of longitudinal studies and so far, no studies have explored or compared the achievement of weight goals in terms of maintenance or gaining BMI. Past studies focus only on obese and overweight people neglecting both anorexia and bulimia and the effort that individuals make to maintain their weight. Furthermore, despite the fact that obesity epidemic research is mainly conducted in developed countries, yet there is an urgent need to understand how to tackle dietary behavioural problems of people living in developing countries. Future studies could also explore in more depth how risk attitudes, time preferences, social cognition models, and personality traits can influence healthy dieting behaviours when monetary values mediate behavioural choices.

In order to fill some of the research gaps reported in Table 1.2, this study focuses on a longitudinal study to understand how the theory of trying and other psychological and non-psychological determinants influence weight goals of individuals in Thailand. Research gaps explored in this study are highlighted with orange and green colours. The green cells indicate that this study will fill research gaps, comparing results from cross-sectional and longitudinal data sets. First of all, this study will use the TOT to measure cognitive determinants of trying to achieve weight goals. Since Bagozzi and Warshaw (1990) proposed the TOT, no further research has been conducted using this conceptual framework in this specific context. To fill this gap, the current study extends

the original framework both including new predictors such as risk attitudes and time preferences and linking the TOT to a contingent valuation study developed on the possibility of introducing a PN programme in Thailand. Literature conducted so far shows that only a few studies linked time preferences to WTP for a program that would increase the life expectancy of participants (Johannesson and Johansson, 1996; Johannesson and Johansson, 1997) and there are no studies exploring PN in this way. Moreover, only Lawless *et al*. (2015) considered the influence of both risk attitudes and time preferences on WTP for a nutraceutical-rich juice blend and, to the best of our knowledge, only Fischer *et al*. (2016) assessed WTP for PN based on demographic characteristics of individuals. In order to include monetary values in the TOT elicited via contingent valuation method, the current study also gives a contribution to methodological aspects of modelling expectancy value theoretical frameworks. To tackle these methodological aspects, intention to try and WTP for the proposed PN programme were estimated comparing censored regression models and a simultaneous equation model via a Heckman sample selection model.

The orange cells instead indicate that this study will fill a gap by using longitudinal data only. For example, as regards risk attitudes, time preferences and personality traits, previous research employed these factors to explain and predict BMI and weight loss of people being overweight and obese. As discussed above, weight goal achievement is very challenging for people who are willing to control body weight either by losing weight or staying the same weight. However, social research has not paid too much attention to the impact of attitudes and personality traits on weight goals achievement. Only Takada *et al*. (2011) considered and confirmed the importance of time preferences and risk attitudes in the context of obesity. However, they only conducted a randomised controlled trial with obese people without including overweight people. In order to fill such a gap, this study will predict weight goal achievements regarding losing weight, staying the same weight and gaining weight where time preferences, sensitivity to punishment, and individual life satisfaction will be the main determinants of a recursive structural equation model.

Table 1.2 Research gaps identified with the literature review

<table>
<tr><th colspan="2" rowspan="2">Research areas</th><th colspan="3">BMI groups investigated</th><th rowspan="2">Intention to weight loss</th><th rowspan="2">Weight goal setting</th><th rowspan="2">Trying to lose weight</th><th rowspan="2">WTP</th><th colspan="3">Goal achievement</th></tr>
<tr><th>Underweight</th><th>Normal weight</th><th>Overweight or obese</th><th>Weight loss</th><th>Maintaining weight</th><th>Weight gain</th></tr>
<tr><td rowspan="4">Economics</td><td rowspan="3">Risk attitudes</td><td></td><td></td><td>Lim and Bruce (2015) - CSRD</td><td></td><td></td><td></td><td rowspan="3">Lawless et al. (2015) – CSRD FG - CSRD & LRD</td><td rowspan="3">Takada et al. (2011) - LRD</td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td></td><td colspan="2">Anderson and Mellor (2008) - CSRD</td><td></td><td></td><td></td></tr>
<tr><td colspan="3">de Oliveira et al. (2015) - CSRD</td><td></td><td></td><td></td></tr>
<tr><td>Time preferences</td><td></td><td></td><td>Komlos et al. (2004) – CSRD Zhang and Rashad (2008) – CSRD Scharff (2009) –LRD</td><td></td><td></td><td></td><td>Johannesson and Johansson (1996) – CSRD; Johannesson and Johansson (1997) – CSRD; Bond et al. (2009) – CSRD; Lawless et al. (2015) – CSRD FG - CSRD & LRD</td><td>Takada et al. (2011) – LRD FG - LRD</td><td>FG - LRD</td><td>FG - LRD</td></tr>
<tr><td colspan="4">Weller et al. (2008) - LRD</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Chabris et al. (2008) – CSRD; Courtemanche et al. (2015) – CSRD</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Personality traits</td><td rowspan="2">STR</td><td></td><td></td><td>Davis et al. (2004a) - CSRD</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Franken and Muris (2005) – CSRD; Davis and Fox (2008) – CSRD</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Research areas		BMI groups investigated			Intention to weight loss	Weight goal setting	Trying to lose weight	WTP	Goal achievement		
		Underweight	Normal weight	Overweight or obese					Weight loss	Maintaining weight	Weight gain
	STP								**FG - LRD**	**FG - LRD**	**FG - LRD**
Expectancy value models	TRA				Leahey *et al.* (2011) - CSRD						
	TPB				Nejad et al. (2004) – LRD; Nejad et al. (2005) –LRD						
	TOT				Bagozzi *et al.* (2004) -LRD	Bagozzi *et al.* (2004) - LRD	Bagozzi and Warshaw (1990) -LRD	**FG – CSRD & LRD**	Bagozzi and Edwards (1998) -LRD		
Satisfaction	Life satisfaction			Korkeila *et al.* (1998) - LRD					Rothman (2000) –LRD; Finch *et al.* (2005) **FG - LRD**	**FG - LRD**	**FG - LRD**

Note: FG = Filling the gap; CSRD = Cross-sectional research design; LRD = Longitudinal research design. Interpretation of colours: 1) No colour means no one has conducted research. 2) Orange indicates that this study fills the gap via LRD; Green indicates that this study fills the gap via CSRD and LRD

1.8 Research questions, objectives and theoretical framework

In the light of the review and discussion conducted so far, it is clear that the achievement of weight goals is a very challenging task mediated by many factors such as eating habits, physical activity, attitudes, social norms, personality traits, commitments, risk attitudes, time preferences and socio-economic background that can impact differently on individuals and change over time. This review also shows that this is an area of research open to future studies where several research gaps can be explored as highlighted in Table 1.2. However, since it is impossible to fill all these gaps in one study, the current research will attempt to answer the following questions:

Q1: What is the most appropriate social cognitive model to evaluate the trying of weight goals achievement?

Q2: Can existing models be extended to include economic determinants and new psychological dimensions?

Q3: What econometric models can be used to analyse cross-sectional data collected employing a combination of expectancy value and contingent valuation models?

Q4: How well can attitudes, social norms, socio-demographic and economic characteristics predict intention to try and WTP for a PN programme?

Q5: What econometric models can be used to analyse longitudinal data collected employing a combination of expectancy value and contingent valuation models?

Q6: How much are Thai citizens willing to pay for a PN programme helping them to achieve their weight goals?

Q7: How can within and between-individual factors influence WTP for a PN programme?

Q8: Are purchasing intentions and WTP for a PN programme stable over time?

Q9: What about the stability of attitudes?

Q10: What is the relationship between weight goal achievement and satisfaction?

As a result, the objectives of this study are first of all to explore how attitudes, social norms, habits, risk attitudes, time preferences, and socio-demographic and economic characteristics of participants recruited in this study influence WTP for a PN programme proposed to reach weight goals. Secondly, this study aims to evaluate

whether stated behaviour and WTP for the proposed PN programme is stable over time, and thirdly, it will assess how personality traits, time preferences, commitment, self-control, BMI change influence life satisfaction and weight goal achievement.

To achieve stated objectives, a conceptual framework was developed, as illustrated in Figure 1.2. As can be observed from Figure 1.2, this conceptual framework is split into part A and part B where distal and proximal elements impacting the output of the models used in this study are highlighted. In influencing the behaviour under investigation, distal elements can be considered more stable while proximal elements are more exposed to changes. Part A is an extension of the TOT where the proximal variables are represented by the original elements of the theory of trying affecting intention to try: attitudes towards the success, attitudes towards failure, attitude towards the process, social norms and past trying behaviour. The original framework introduced by Bagozzi and Warshaw (1990) is modified including, other than socio-economic demographic characteristics, the new distal elements: current unhealthy habits, risk attitudes and time preferences. The new elements were introduced because, according to past studies reviewed so far, it was observed that these new elements influence health outcomes such as smoking and drinking behaviour (Anderson and Mellor, 2008; Warshawsky-Livne *et al*., 2012; Fox, 2013; Leonard *et al*., 2013; Sutter *et al*., 2013; Courtemanche *et al*., 2015). The original TOT framework is also modified about the way in which behaviour was measured because the classic intention to perform an intention to trying the new technology was coupled with WTP for the PN programme helping Thai participants to reach their stated weight goals. As a result, in the output stage, a contingent valuation method is used to elicit and estimate WTP for trying the PN dietary service. Moreover, a mixed research design was implemented to investigate the influence of within- and between-individual factors on WTP for PN programme.

Part B represents a conceptual framework where an inhibition facilitator commitment mechanism of participants' goal achievement is explored. In Part B, time preferences and personality traits are measured using sensitivity to punishment to represent the distal variables, while self-control and goal commitments are the proximal variables. Essentially, self-control and goal commitments are the inhibition process that individuals face when they want to give up their stated goal achievements. The output of this model captures how distal and proximal elements affect BMI changes, life satisfaction and goal achievement.

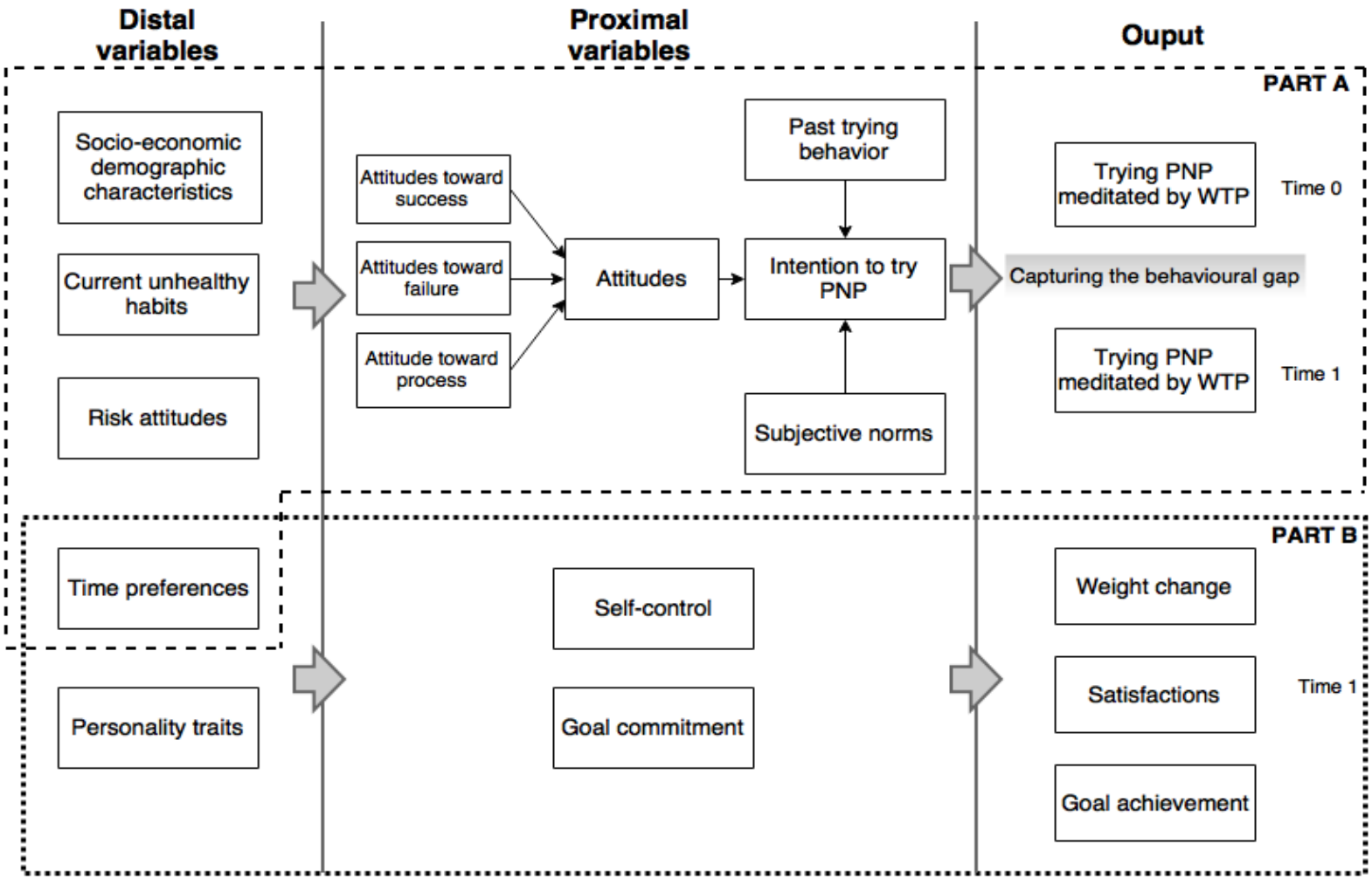


Figure 1.2 Conceptual framework: psychological and economic factors influencing weight goals

1.10 Data collection

This study targeted adults who are concerned about their weight and work in Bangkok. Participants were recruited by advertising in local shops, café, several small businesses, government offices and social media. Interviewers contacted people who accepted to take part in the study and invited them for face-to-face interviews at the office of Centre for Applied Economics Research, Kasetsart University or café nearly participants' work place. Participants were offered an incentive by THB 300 in total (THB 150 when finished the first interview and the rest when finished the second interview). Data collection of the first survey was conducted between November and December 2015. Interviewers proceeded the interview following the protocol (see Appendix A). Participants were required to fill the answers the set of questionnaires: health information including weight and height, weight goal setting and goal commitment (GC) assessment, scenario of personalised nutrition service, payment cards, resistance to eating temptation, risk attitudes and time preferences, satisfaction evaluation, sensitivity to punishment and sensitivity to reward questionnaire and personal information. In the section of weight goal setting, participants were asked to set their weight goal (losing weight, staying the same and gaining weight) and to specify the weight desire for the next six months (during May and June 2016). The questionnaire of the second survey followed the first survey excluding height information, sensitivity to punishment and sensitivity to reward questionnaire and personal information. The questionnaire was translated into Thai and evaluated via three pilot studies. The first two pilots aimed to test language balance via seventeen volunteers who can communicate both in Thai and English. The third pilot tested the revised version by twenty-eight volunteers. This research has been reviewed according to the procedures specified by the University Research Ethics Committee of University of Reading.

There are 597 volunteers participated in the first survey. The majority of participants were women (60.8%), educated at university level (85%) and with a gross monthly income between THB 10,000 and THB 30,000 (64.7%). The age of participants ranged from 17 to 74 years with an average age of 32 (SD=10.04) and with 50% of participants working for private companies, 31.2% for governmental organisations and 20.95% running their own business. The analysis of the stated BMI showed that 46.4% were classified as being normal weight (BMI $\geq$18.5 and $\leq$ 23.0), 7.1% being underweight

(BMI<18.5), 29.2% being overweight (BMI >23.0 and ≤27.5) and 17.3% being obese (BMI > 27.5).

In the second survey, 89 participants (14.9%) of the original participant (n=597) were absented to follow up for three reasons, not willing to participate the research for the second survey (n=63), moving workplace to other provinces (n=5), no contract information at follow-up (n=21). Finally, 508 participants (60.63% female, range 18-74 years) were willing to participate in the second survey. The average initial BMI of the final participants was 23.6 (SD=4.9). According to the criteria of Asian weight status (WHO expert consultation, 2004), a 43.4% of all participants was normal weight; 30.0% was overweight; 16.7% was obese, and 9.6% was underweight.

1.11 Thesis outline

The remainder of the thesis consists of five chapters where the research questions presented in the previous section will be answered, as illustrated in Table 1.3.

Table 1.3 Identification of research questions and their answers by chapters

	Research question	Research design
Chapter 1	Identification of research questions via literature review and research gaps Answering Q1	
Chapter 2	Answering Q2, Q3, and Q4	Between-individual design using cross-sectional data
Chapter 3	Answering Q5, Q6, Q7, Q8 and Q9	Mixed design using longitudinal data
Chapter 4	Answering Q10	Between-individual using longitudinal data
Chapter 5	Conclusion and recommendations	

Chapter 2 aims to answer research questions 2, 3, and 4. This chapter will attempt to estimate data related to Part A of the proposed conceptual framework (Figure 1.2) comparing four regression models: Interval regression, Tobit, Double hurdle and Heckman sample selection. The analysis of this chapter will use the data from the second survey. The estimation process considers the intention of trying the PN as an intermediate behavioural step to achieve the stated goal, while WTP estimates provide

information about the magnitude of intention of trying in monetary values. As well as discussing the impact of distal and proximal elements of the extended TOT the paper will argue about the possibility of using these types of regressions when mixing models of economics and social psychology.

Chapter 3 aims to answer research questions 5, 6, and 8. This chapter attempts to investigate the influence of within-individual factors on WTP for PNP. To achieve this objective, a mixed research design was implemented using both cross-sectional and longitudinal datasets based on the data collected in the first and the second survey. The stability of behavioural intentions and WTP will be estimated using the most appropriate regression model identified in Chapter 2. Thus, this paper also explores the impact of between-individual factors on WTP for PNP and relative changes between the two periods analysed.

Chapter 4 aims to answer research questions 9 and 10. This chapter will examine the influence of time preferences and personality traits on self-efficacy and commitment leading to the outcomes of weight goals (Part B of Figure 1.2). The data from the first survey was used in the analysis of time preferences and personality traits according to sensitivity to punishment and the data from the second survey was used in the analysis of self-efficacy in relationship with resistance to eating temptation, goal commitment, satisfaction and goal achievement.

Chapter 5 will summarise the main results of this study, limitations and insights for future research. Finally, the thesis will also contain two appendices which will contain respectively the questionnaire and a poster paper presented at EAAE congress "Towards Sustainable Agri-Food Systems: Balancing between Markets and Society" in Parma, Italy in August 2017.

CHAPTER 2

MODELLING EXPECTANCY VALUE MODELS AND STATED WTP ELICITED VIA CONTINGENT VALUATION STUDIES: INSIGHTS FROM A COMPARISON OF SELECTED REGRESSION MODELS

Abstract

This study compares different regression models to evaluate how good they are when research designs combine expectancy value models with economic models used to estimate markets of hypothetical goods or services. To achieve this objective the four regression models (Tobit, interval regression, double hurdle and Heckman sample selection) were used to estimate willingness to pay for a hypothetical personalised nutrition service that might be introduced in Thailand over the next years. The contingent valuation study was combined with the theory of trying proposed by Bagozzi and Warshaw to see how well proximal and distal elements of this conceptual framework predict intention and purchasing behaviour of the proposed personal nutrition service.

Results show that for several reasons the Heckman sample selection model performs better than other regression models because it keeps the integrity of expectancy value models when mixed with contingent valuation studies. Main results suggest that proximal elements of the expectancy value model should be inserted in the first stage while distal elements should be allocated in the second stage. Finally, policy implications of findings related to the acceptance and willingness to pay (WTP) for this innovative technological service are discussed in the conclusions.

JEL classification: D91

PsycINFO classification: 2229, 3920

Keywords: Expectancy value model; Theory of trying; Contingent valuation; Heckman sample selection model; Willingness to pay

2.1 Introduction

Expectancy value models such as the Fishbein model, Theory of Reasoned Action, Theory of Planned behaviour, Theory of Trying, and Technology Acceptance Model have become very popular and used by researchers to understand and to predict behaviour in different contexts such as family planning, work, religion, environmental protection, drug use, problem solving health, racism, socio-political activities, consumption and so on. These conceptual frameworks recognise that behaviour is influenced by numerous biological, psychological and social factors, but they specify only those that are assumed to be very close to the behaviour under investigation (Sutton, 2004; Fishbein and Ajzen, 2010). These elements are known as proximal determinants and are generally represented by attitudes, social norms, perceived behavioural control, perceived usefulness, habits and other thoughts or feelings which could have an immediate impact on behaviour. Elements that are not immediately present, cultural upbringing, socio-demographic and economic characteristics of individuals are named distal elements.

The identification of the behaviour to investigate is a crucial point to the applications of these conceptual frameworks because it has to be identified unambiguously in relation its action, target, context and time elements (Fishbein and Ajzen, 2010). Applications are generally measured with Yes/No questions or with the likelihood to purchase a certain good or service measured on 4 or 5 point scales (Pouta and Rekola, 2001; Tarkiainen and Sundqvist, 2005; Yazdanpanah and Forouzani, 2015). For example, would you like to pay for the gym fee for one year? This kind of question provides information of people's willingness to pay for exercise at the gym for one year. We can use frequency scales to measure how often people visiting the gym since last month via a verbal scale ranging from never to always. Continuous scale can be used to assess the magnitude of the exercise in terms of monetary value if researchers are interested in how much people pay for the gym fee. However, measuring purchasing behaviour in this way has limitations because people do not take into account how much they have to pay to engage with the proposed behaviour or to achieve a certain goal (Sheppard *et al.*, 1988; Fishbein and Ajzen, 2010). For example, lack of money could be an obstacle to perform a behaviour or to achieve a goal which requires the buying of expensive durable goods such as an electric car, but it might not be a problem in the case of cheap goods like bread, pasta, toothpaste and so on.

Social psychologists have considered stated behaviour in terms of behavioural intention that is partially determined by attitudes to understand why people choose and what motivates purchasing behaviour, while economists have used the contingent valuation method for evaluating willingness to pay derived from stated behaviour to understanding purchasing behaviour (Harris *et al*., 1989; Bamberg, 2002; Spash and Biel, 2002; Spash *et al.*, 2009). To bypass this criticism researchers have attempted to combine these conceptual frameworks with contingent valuation (CV) methods especially in the field of environmental study (Ryan and Spash, 2011). In these few studies (see Table 2.1), intention to perform a behaviour or to achieve a goal is captured with a Yes/No question where the Yes answers are coupled with willingness to pay elicited using different formats such as open-ended, single- bound, double bound and payment cards. Considering the censored distributions of monetary values collected in these studies researchers have used different regression and structural equation models to incorporate proximal and distal elements of expectancy value models.

For example, Ajzen and Driver (1992b) employed theory of planned behaviour to explain WTP for a fee regarding leisure activities via hierarchical regression. Kerr and Cullen (1995) applied theory of reason action performing factor analysis as intermediate technique to identify latent dimensions which were used subsequently to estimate WTP via logit model to explain the public preference of possum-control budget. Pouta and Rekola (2001) also used the theory of planned behaviour to estimate WTP for the abatement of forest regeneration via logit and tobit models. Other studies applied structural equation modelling to predict WTP incorporated by the extended TPB (López-Mosquera and Sánchez, 2012; López-Mosquera, 2016). For instance, López-Mosquera *et al*. (2014) extended the theory of planned behaviour by adding a moral norm into the model to determine the influence of WTP of visitors for park conservation.

Table 2.1 Application of Expectancy value model and contingent valuation survey (WTP)

No.	Authors / Title	Objectives	Methods	CVM	Tools	Sample/Country
1	Ajzen and Driver (1992a): Contingent value measurement: On the nature and meaning of willingness to pay	To explain the willingness to pay for a user fee for engaging in five leisure activities	TPB	Open-ended, single bound	Correlation, Hierarchical regression	150 USA
2	Kerr and Cullen (1995): Public preferences and efficient allocation of a possum-control budget	To construct a measure of attitudes toward possum control on the basis of beliefs and their evaluations	TRA	Single bound	Factor analysis, Logit model	New Zealand
3	Luzar and Cosse (1998): Willingness to pay or intention to pay: the attitude-behavior relationship in contingent valuation	To identify a conceptual model of attitude-behaviour relationship consistent with the process of CV	TPB	Open-ended	Ordinary least square	664 USA
4	Batley *et al*. (2000): Willingness to pay for renewable energy: Implications for UK green tariff offerings	To elicit WTP for electricity generated from renewable energy	TPB	Open-ended, single bound	Stepwise regression	746 UK
5	Pouta *et al*. (2000): Contingent valuation of the Natura 2000 nature conservation programme in Finland	To illustrate how CV studies can produce relevant information for public nature conservation decisions	TRA	Yes/No with two options	Logit model	1085 Finland
6	Pouta and Rekola (2001): The theory of planned behaviour in predicting willingness to pay for abatement of forest regeneration	To examine WTP response obtained through CV in the context of TPB	TPB	Standard Yes/No, Open-ended	Logit and Tobit model	600 Finland
7	Werner *et al*. (2002): Family caregivers' willingness to pay for drugs indicated for the treatment of Alzheimer's disease: an economic or psychological model?	To examine the WTP for drug treatment of family members caring for patients with probable Alzheimer's Disease	TPB	Double bound	Double-bounded Logit model	220 Israel
8	Ajzen *et al*. (2004): Explaining the discrepancy between intentions and actions: The case of hypothetical bias in contingent valuation	To investigate the intention-behaviour discrepancy in the context of contingent value measurement	TPB	Yes/No with fixed monetary value	SEM	160 USA

No.	Authors / Title	Objectives	Methods	CVM	Tools	Sample/Country
9	Pouta (2004): Attitude and belief questions as a source of context effect in a contingent valuation survey	To evaluate the effect on CV results of measuring respondents' beliefs and attitudes prior to presenting them with a dichotomous choice	TRA	Yes/No with fixed monetary value	Logit model	550 Finland
10	Meyerhoff (2006): Stated willingness to pay as hypothetical behaviour: Can attitudes tell us more?	To analyse the relationship between different kinds of attitudes and behaviour	TPB	Open-ended, payment card	Logit model, SEM	289 Germany
11	Bernath and Roschewitz (2008): Recreational benefits of urban forests: explaining visitors' willingness to pay in the context of the theory of planned behavior	To assess the potential of the theory of planned behavior to improve standard economic models	TPB	Payment card, double bound	Nested model: Probit model and ordinary least square	558 Switzerland
12	Nocella *et al*. (2010): Farm Animal Welfare, Consumer Willingness to Pay, and Trust: Results of a Cross-National Survey	To investigate role of trust in consumer WTP for AFP is paramount	TRA	Double bound	Double-bounded Logit model	1,416 Italy, Britain, Germany, Spain, and France
13	Ryan and Spash (2011): Is WTP an attitudinal measure? Empirical analysis of the psychological explanation for contingent values	To examine the association between WTP responses attitudes about an environmental proposal	TPB	Open-ended	Logit model and ordinary least square	713 United Kingdom, 1069 Scotland
14	Hsu and Yen (2012): Customers' Adoption Factors and Willingness to Pay for Home Energy Information Management System in Taiwan	To investigate the residential customers' preferences and willingness to pay	TAM	Standard Yes/No, open-ended	SEM	141 Taiwan
15	López-Mosquera and Sánchez (2012): Theory of Planned Behavior and the Value-Belief-Norm Theory explaining willingness to pay for a suburban park.	To analyse the environmental profile of park visitors using the components of TPB and the VBN, and to determines WTP for park conservation	TPB	Single bound	SEM	194 Spain
16	López-Mosquera *et al*. (2014): An extension of the Theory of Planned Behavior to predict willingness to pay for the conservation of an urban park	To determine the influence on WTP of visitor for park conservation via the extension of TPB	TPB	Single bound	SEM	190 Spain

No.	Authors / Title	Objectives	Methods	CVM	Tools	Sample/Country
17	López-Mosquera (2016): Gender differences, theory of planned behavior and willingness to pay	To explore gender differences in an expanded model of TPB explaining WTP for the park conservation	TPB	Single bound	SEM	226 Spain
18	Sayruamyat *et al*. (2017): Consumers' Acceptance of Personalised Nutrition Programme in Thailand: Impact of Attitudes, Risk and Time preferences on Trying and Willingness to Pay	To explore how time preferences and risk attitudes influence WTP for a new health service based on the concept of Personalised Nutrition (PN).	TOT	Payment card	Heckman selection model	597 Thailand

Note: TRA – Theory of reasoned action, TPB – Theory of planned behaviour, TOT – Theory of trying, CV – Contingent valuation, theory, SEM – structural equation model

Also in this study, we combine an expectancy value model (theory of trying) with contingent valuation to evaluate whether Thai people are willing to try and pay for a personalised nutrition (PN) programme helping them to achieve weight goals. PN is a relatively new concept that links the genotype of individuals with their health risks advising them on specific diets that they should follow to prevent diseases to which they might be exposed sooner or later in their life (Joost *et al*., 2007). Obesity and related diseases such as high blood pressure and so on, as well as being a symptom of poor life quality, are exerting an enormous pressure on health care spending for governments' budgets. Thus, information about acceptance and willingness to pay (WTP) for this innovative technological service could be useful for policy makers and other stakeholders as one of the tools to be used to tackle the obesity epidemic which shows no signs of abatement in any country around the world (Fischer *et al*., 2016).

Despite the fact that these studies explore how psychological constructs can improve the prediction of WTP, scanty research has been conducted on how to model predictions of these latent dimensions both the intention to pay (WTP) and stated pay amount ($WTP) simultaneously (Rosenberger *et al*., 2012). As a result, the objective of this study is not centred on empirical findings of willingness to try and to pay for a PN programme, but on exploring how well different regression models can predict purchasing behaviour incorporating proximal and distal elements of expectancy value models contemporarily. This is because linking expectancy value models to intention to pay and stated pay amount is like having a conceptual framework which is developed on two sequential stages. Stage one is represented by the intention/decision to undertake the proposed behaviour, while stage two deals with stated monetary values for the proposed behaviour. If the two stages are sequential, the estimation of these models should link stage one and stage two with a system of simultaneous equations.

To achieve such objectives, we compare stage one and stage two regression models and attempt to answer the following questions. Is it better to estimate expectancy value models linked to contingent valuation studies with one or two stages models? When thinking of proximal and distal variables, how can researchers take into account bias generated by the way in which the sample is selected to estimate WTP? If a two-stage regression model is going to be used, is it indifferent to include proximal elements in stage one and distal elements in stage two?

The remainder of this paper is organised as follows. Section 2 gives details of the background of the empirical work. Section 3 provides the details of the conceptual framework developed to test selected regression models, the measurement of TOT's proximal elements and WTP for PNP and then discusses selected regression models, modelling issues, and assumptions of the analysis. Section 4 provides information of data collection. Section 5 compares and discusses results of regression models. Section 6 draws conclusion and implications for policy makers and future research.

2.2 Methodology

2.2.1 Conceptual framework

In order to answer research questions and achieve our objective, we combined an extended version of the theory of trying (TOT) with a hypothetical market for a PN programme helping Thai people to achieve weight goals. The TOT was introduced by Bagozzi and Warshaw (1990) to evaluate intention to trying to lose weight, taking into account the following proximal elements: attitudes towards success, failure and process, subjective norms and habits.

Figure 2.1 illustrates the conceptual framework used in this study. Stage one focuses on the decisional process of the model which highlights the proximal elements influencing more close intention to try (ITT) for the PNP, while stage two deals with action related to the hypothetical market scenario for PNP and distal elements influencing the behaviour. ITT is a key moderator for decision making as it bridges the gap between proximal elements and distal elements linking them via WTP for PNP. In the proposed framework, the expectancy values of success (EVS) and failure (EVF) are obtained respectively multiplying attitude towards the success or failure by the expectation of success or failure in relation to achieving the goal by using PNP. Attitude towards process (AP) reflects the experience and consequences of trying the PNP leading to the goal weight achievement. Subjective norms (SN) elicit how important individuals can influence intention and behaviour of trying PNP, while the frequency of past trying (PT) captures how individuals may feel undecided about their intention to try a goal.

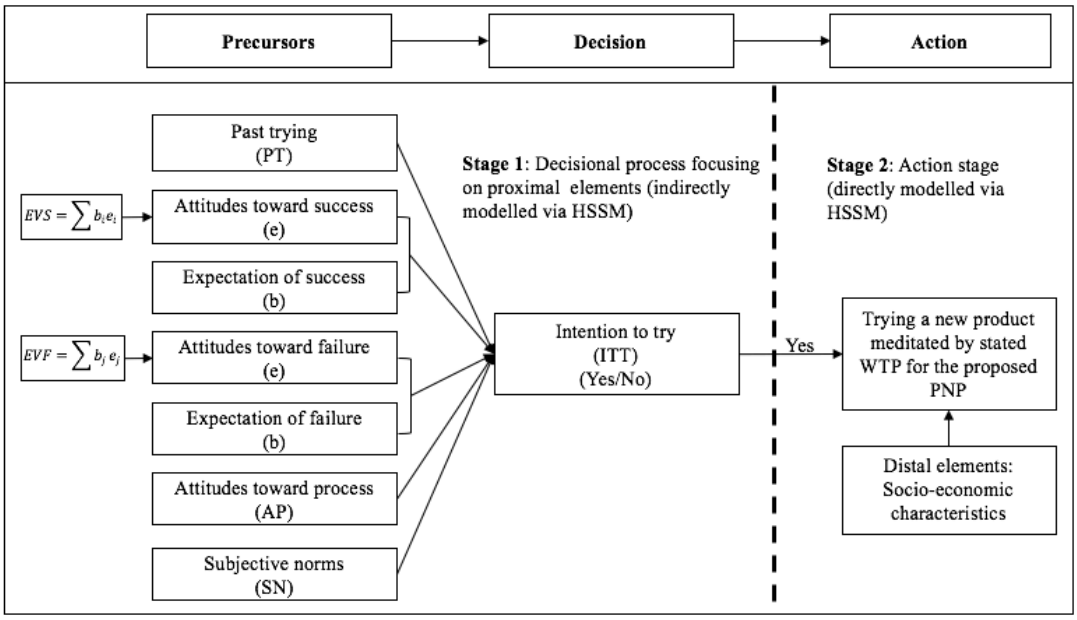


Figure 2.1 Conceptual framework of modelling WTP via extended theory of trying

The TOT assumes that the higher the scores of EVS and AP, the higher ITT and WTP for PNP. By the same token, we can say that the higher the scores of EVF, the lower ITT and WTP for PNP. Stage 1 also illustrates that PT and SN influence ITT and WTP for PNP positively. Stage 2 instead indicates that socio-demographic and economic variables influence WTP for PNP independently. As a result, a questionnaire was developed and divided into three parts to elicit information about proximal determinants, contingent valuation market scenario of the proposed extended TOT, and distal elements, i.e. socio-demographic and economic characteristics of participants.

Information reported in Table 2.1 has shown that when researchers combine expectancy value models with CV surveys, they generally use different regression models but without linking them to the idea that when people engage with a certain behaviour some predictors (proximal) are more important than others (distal). Only two studies took into account this aspect. In the first study, Bernath and Roschewitz (2008) used a two nested regression model where they combined the theory of planned behaviour with WTP for recreational benefits in the Zurich city forests. They estimated stages one and two separately comparing models with and without the elements of the theory of planned behaviour to argue about the superiority of models including psychological constructs. Stage one was estimated via a probit model predicting the probability of voting for a visiting permit, while stage two estimated WTP via a linear

regression model which excluded the protesters group to eliminate the sample selection bias problem. In the second study, Rosenberger *et al*. (2012) attempted to explore how attitudes towards the specific behaviour of paying a fee was directly associated with the intention to pay an annual fee at McDonald Dunn forest in Oregon. The employed a Heckman sample selection model (HSSM) to predict how attitudes directly affect intention to pay and indirectly stated WTP. Their modelling approach was not linked to any expectancy value models and attitudes were measured using a single item capturing support or opposition for a mandatory annual use fee.

According to the HSSM, the selection model focuses on the decision stage that explores how precursors influence the decision, which in turn directly influences the action of the outcome model. This idea matches the lies in the same concept of expectancy value models (i.e. TOT) because it explains the precursors (EVS, EVF, AP, PT and SN) – behaviour (trying PNP/WTP for PNP) relationship, which is mediated by ITT. To fit the procedure of the HSSM predicting the probability of ITT, this study uses a dichotomous measure of ITT to predict WTP for PNP (Sutton, 2004). We employ the HSSM to test the following hypotheses:

H1: The proximal elements of TOT are directly related to ITT.

H2: The proximal elements of TOTare indirectly related to stated WTP for PNP.

H3: The distal elements of TOT are directly related to ITT.

H4: The distal elements are directly related to stated WTP for PNP.

Results of the Heckman sample selection model will also be compared with findings obtained from other regression models used in these types of studies appears to explore the bias prediction problem linked to censored distribution WTP values (see Section 2.3).

2.2.2 Measurement of proximal and distal elements

Before starting to collect information about the elements of the TOT, participants were shown a card where the concept of PN was illustrated with a series of sequential pictures depicting the proposed intervention using the following scenario:

> *Imagine that a new service will be available on the market to help you to achieve your stated weight goal. The new service is offered by a pool of experts (GP, nutritionist and psychologists) who will personalise your diet taking into account aspects of your genes, personality, health status, body*

mass index, phenotype and your current diet. This is what experts call 'personalised nutrition'.

Personalised nutrition will help you to follow a diet, which as well as helping you to achieve your stated weight goal will also help you to minimise the risk of diseases related to obesity and overweight such as diabetes, heart disease and cancer. This service includes four stages (show card):

1. A doctor will collect information about your health status, physical activity, BMI, and dietary habits including food intolerances and allergies.

2. You will be offered a genetic blood test (nutrigenomic test) to understand the basis of your genes and what type of food you should consume to reduce the risk of developing obesity related diseases mentioned before.

3. The results of your nutrigenomic test will be discussed together with a GP, nutritionist and psychologist to prepare a list of foods, menus and recommendations that you have to follow to achieve your goal.

4. After this initial stage, you are required to visit the centre every two weeks. During these visits, you will be monitored in terms of progress towards the achievement of your stated weight goal and discuss your personal situation with a nutritionist and a psychologist.

Proximal elements were measured following Bagozzi and Warshaw's approach (1990) using expectancy values score for AS and AF, and a global measure of attitudes for AP. For example, as regards EVS, AS was elicited asking participants to answer the following statement "When people diet some succeed and some fail. If you are trying PNP and during the next six months you succeed to achieve your weight goal, this would make you feel" (1 = extremely unpleasant, 7 = extremely pleasant). ES instead was measure on a likelihood scale in the following way: "Assuming I try to follow PNP during the next six months, it is likely/unlikely that I would succeed to achieve my goal" (1 = extremely unlikely, 7 = extremely likely). EVF was measured in the same way, while AP measured asking participants to express their level of plesanteness towards the process on a 7-point scale ranging from 'extremely unenjoyable' to 'extremely enjoyable'. SN was mesasured asking on a 7-point scale the approval or disapproval of important people on the decision to follow the proposed PNP during the next six months. Past trying behaviours were instead captured asking participants to indicate the frequency of past trying to control their weight during the past six months (1 = never, 6 = very many times). In our case this element was measured as past frequency of having tried to achieve weight goals. Information regarding distal

elements (gender, age, education, employment and income) was collected with a section placed at the end of the questionnaire.

2.2.3 Contingent valuation scenario for the proposed PNP and measurements

After having collected information on the elements of TOT, respondents were reminded about the proposed PNP and asked to express first their intention to try this new service which was not free and available to them next week. If participants did not intend to try PNP, they were asked to give reasons for their rejection such as lack of trust in this programme, lack of money, demotivation to achieve the goal, capability of achieving the goal without the service and the service should be available to all citizens. These participants were not asked to express their WTP for PNP.

Respondents who stated 'Yes' were asked to mark their maximum amount of money for trying this PNP for the next six months. Monetary values were elicited via a payment card where participants were asked to pay the maximum lump sum for this service from bids ranging from zero to THB 30,000 (approximately US$ 1,000). When a participant marked the last bid on the payment card she was asked to specify how much more she was willing to pay.

2.2.4 Econometric modelling of expectancy value models and WTP

In order to achieve the stated objective and test the hypotheses, we compare four different econometric models estimated using STATA: Heckman sample selection model (HSSM), Double hurdle model (DHM), Tobit model (TM) and Interval regression (IR). Generally in these models the distribution of the dependent variables (stated WTP) is be censored and has a large numbers of zero value or missing values (Heckman, 1974; McDonald and Moffitt, 1980; Nawata and Nagase, 1996; Newman et al., 2003; Greene, 2012). This was also the case of the current study where participants' stated that WTP for PNP was used as a dependent variable to compare the HSSM, DHM and TM. To estimate also an IR, we transformed the censored distribution of WTP for PNP in interval values because the propsed payment card for PNP contained a fairly detailed set of bids and thus the true value of WTP could be somewhere in the range of the stated option and the next higher option (Cameron and Huppert, 1989).

Given that the functional form of WTP is unknown and the maximum WTP for PNP is estimated using the indirect utility function, WTP for PNP can be expressed based in the TM by using the following underlying latent variable

$$WTP_i^* = \begin{cases} x_i'\beta + z_i'\gamma + \mu_i & \text{if } x_i'\beta + z_i'\gamma + \mu_i > 0 \\ 0 & \text{if } x_i'\beta + z_i'\gamma + \mu_i \leq 0 \end{cases} \quad , i = 1, 2, \dots, N \qquad (1)$$

where: WTP_i^* is the latent censored WTP for PNP assuming that stated WTP_i for PNP is ≤ 0, and remains uncensored when stated WTP (WTP_i) is > 0; N is the number of observations; x_i' is the set of proximal variables; z_i' is the set of distal variables and μ is the error term of outcome equation, which are normal distributed ($\mu_i \sim N(0, \sigma^2)$) and β is a parameter vector of proximal and distal elements.

However, the estimation of WTP for PNP via TM can bias prediction (Heckman, 1974; McDonald and Moffitt, 1980) because stated WTP has missing values when participants do not to intend to try (NITT) the proposed PNP and thus these values might not be zero. In order to tackle this issue, the HSSM classified by Amemiya (1985) as Type II Tobit model is an alternative and more appropriate method to estimate WTP when researchers face problems of sample selection bias and limit value of responses. Thus, taking into account ITT and the sample selection bias of our conceptual framework the condition of stated WTP (WTP_i) can be rewritten as follows:

$$WTP_i = \begin{cases} WTP_i^* & if \quad ITT_i = 1 \\ 0 & otherwise \end{cases} \qquad (2)$$

In equation 2, WTP_i was missing when the proposed PNP was rejected. The probability of the ITT function is derived in equation 3 by estimating a probit model dealing with sample selection bias on WTP function as follows:

$$ITT_i^* = z_i'\gamma + \nu_i \qquad \nu_i \sim N[0,1]$$

$$ITT_i = 1 \text{ if } ITT_i^* > 0, \text{ 0 otherwise.} \qquad (3)$$

Where: ITT_i^* is the latent ITT dimension towards PNP for participant *i,* and z_i' is the vector of proximal elements of TOT (EVS, EVF, AP, PT and SN), γ is the vector of coefficients of proximal elements and ν is the error term for selection equation. Thus, the prediction of WTP is based on two conditions. The first condition estimates $E(WTP_i|x_i, z_i)$ only for ITT_i = 1, and is expressed as follows:

$$E(WTP_i|x_i, z_i) = E(WTP_i^*|ITT_i = 1, x_i, z_i)$$

$$= x_i'\beta + \rho\sigma_\mu \frac{\emptyset(z_i'\gamma)}{\Phi(z_i'\gamma)}$$

$$= x_i'\beta + \rho\sigma_\mu \lambda(z_i'\gamma) \quad (4)$$

Where: $\emptyset(.)$ is the probability density function (PDF) of the standard normal distribution. $\Phi(.)$ is the cumulative distribution function (CDF). $\sigma$is the standard error and ρ is the correlation coefficient between error terms μ and ν which have a bivariate normal distribution with zero mean. Given $\beta_\lambda = \rho\sigma_\mu$ and $\alpha_\nu = (0 - z_i\gamma)/\sigma_\nu$, therefore, $\lambda(\alpha_\nu) \equiv \frac{\emptyset(z_i'\gamma)}{\Phi(z_i'\gamma)}$ represents the inversed Mills ratio i.e. the ratio between the normal standard PDF and the normal standard CDF. If the two error terms were uncorrelated, we would observe $\rho = 0$ and as a result β_λ would be zero. When β_λ is significant, the sample selection bias of data is observed.

The second condition estimates $E(WTP_i|WTP_i > 0)$ when the probability of ITT (see eq. 3) is positive as follows:

$$E(WTP_i|WTP_i > 0) = E(WTP_i|ITT_i^* > 0)$$

$$= x_i'\beta + \beta_\lambda \lambda(\alpha_\nu) \quad (5)$$

If the correlation between μ_i and $\nu_i$is zero (ρ=0), there is no sample selection bias in the prediction of WTP and thus:

$$E(WTP_i|x_i, z_i) = x_i'\beta \quad (6)$$

In comparison to the Heckman-two-step procedure that may perform poorly (Nawata and Nagase, 1996), a more efficient full maximum likelihood estimation that follows the original Heckman sample selection bias model (Heckman, 1974) was proposed by Nawata and Nagase (1996) to estimate stages 1 and 2 of equation 5 simultaneously. Nawata and Nagase (1996) also noted that this procedure would perform well and reasonably when predictors of the outcome model differ from the selection model because endogeneity can be avoided. Therefore, the log-likelihood function contains two parts consistent with the observation mechanism. Part 1 deals with observations on ITT_i = 0 and considers the probability of missing stated WTP in the outcome equation. Part 2 deals with observation on ITT_i = 1 and considers the probability of stated WTP

multiplied by the conditional density of the observed WTP. According to Greene (2012), the full log-likelihood function is presented as

$$\ln L = \sum_{ITT_i=1} \ln[p(ITT_i = 1) f(WTP_i^* | ITT_i = 1)] + \sum_{ITT_i=0} \ln p(ITT_i = 0)$$

$$= \sum_{ITT_i=1} \ln \left[\frac{\exp(-(1/2)u_i^2/\sigma_u^2)}{\sigma_u \sqrt{2\pi}} \Phi \left(\frac{\rho u_i/\sigma_u + z_i'\gamma}{\sqrt{1-\rho}} \right) \right] + \sum_{ITT_i=0} [1 - ln\, \Phi(z_i'\gamma)] \quad (7)$$

Finally, WTP for PNP was also estimated using DHM (Cragg (1971) because it represents an alternative two-stage model which addresses the corner solution of zero consumption encountered when using TM. The model assumes that participants must make two decisions to buy a service leading to real consumption, and each decision may be determined by a different set of observed variables. The first hurdle focused on the decision process (see Figure 2.1) which uses a standard probit regression (equation 3), while the second hurdle is due to economic reasons of the action stage, which uses equation 5 (Newman *et al*., 2003). DHM-two-step procedure is estimated by MLE as the HSSM. However, HSSM will fit data better if researchers know the reason for missing data and the decision of both stages is correlated. In contrast, DHM is more appropriate when the selection stage does not dominate the outcome stage because the covariance between two error terms equal zero that contrasts with HSSM assumption (Madden, 2008; Wooldridge, 2010).

2.3 Data collection

Respondents were recruited by advertising the research in several local markets, small businesses, companies and governmental offices. The questionnaire was translated into Thai and appraised by three pilot studies. The first two pilots were targeted to test language equivalence with bilingual Thai-English volunteers. The last pilot tested the revised version with twenty-eight volunteers and the study was designed and conducted in compliance with the ethical guidelines of the University of Reading. Respondents who agreed to take part in the study were interviewed face-to-face between November and December in 2015.

2.4 Results

2.4.1 Socio-economic characteristic of participants

The final sample size is 508 and descriptive statistics show that women accounted 60.3%, 69.2% had bachelor degree and the average age of participants was 32 (*s* =10.08) ranging from17 to 74 years (see Table 2.2). Even though the sample might seem biased about education, this result reflects the current situation in the Bangkok area where about 96% of people have at least a degree. Thus, when recruiting participants an effort was made to oversample people not having a degree. The majority of participants (65.7%) had a gross monthly salary in the range of THB 10,000 – THB 30,000 and 48.4% of participants were working for private companies, 30.3% for public organisations and 21.2% running their businesses.

2.4.2 Comparison of proximal and distal elements via ITT for PNP

Table 2.2 as well as showing the average values of the proximal elements of TOT, compares the values of these scores between the 260 participants who stated their intention to try (ITT) and the 248 of those who did not intend to try (NITT) the proposed PNP. The average EVS expectancy value was 22.6 and nearly two times greater than the average EVF expectancy score (13.3), while the average values of AP, PT and SN were respectively 4.6, 4.5 and 3.5. In addition, the comparison of means between ITT and NITT participants reveals that the former group scored higher than NITT on EVS, AP, PT and SN and their mean differences were statistically significant to the independent sample t-tests. As regards EVF, we observe the opposite pattern, but the mean difference was not statistically significant to the independent sample t-test. Table 2.3 instead presents differences between distal elements and the ITT and NITT groups. In particular, among categorical variables only gender was significant with males (57%) more inclined than females (47%) to try the PNP. As regards continuous variables, age and education were both statistically significant to the independent sample t-test with younger and better educated participants more willing to try the PNP programme.

Table 2.2 Summary statistics of proximal elements for intenders, non-intenders and total sample

Variables	ITT n = 260	NITT n=248	Total sample n = 508	t-test
EVS	25.0 (7.19)	20.3 (6.76)	22.7 (7.36)	-5.09[a]
EVF	13.0 (5.62)	13.7 (4.99)	13.3 (5.33)	0.027
AP	4.8 (.91)	4.4 (.82)	4.6 (.89)	-3.86[a]
PT	4.8 (1.08)	4.3 (1.01)	4.5 (1.07)	-4.36[a]
SN	3.8 (1.19)	3.1 (1.39)	3.5 (1.33)	-3.64[a]

Note: Standard deviations are in parenthesis. [a] Significant level at 1%, [b] Significant level at 5%, [c] Significant level at 10%.

Table 2.3 Summary statistics of distal elements for intenders, non-intenders

Variables	ITT n = 260	NITT n=248	Statistic test
FEMALE (1 if female)	56.1%	65.3%	χ^2= 4.47[b]
AGE (Unit: years)	30.6 (8.35)	33.9 (11.39)	t-test= 3.75[a]
INCOME (THB 10000-30000)	65.7%	65.6%	χ^2=11.72
EDU (Unit: years)	15.9 (1.66)	15.3 (2.33)	t-test= -3.28[a]
EMP_{SEL} (1 if self-employed)	29.6%	19.7%	χ^2= .65
EMP_{GOV} (1 if working for public organisation)	29.2%	31.4%	χ^2= .29
EMP_{PRI} (1 if working for private company)	48.0%	48.9%	χ^2= .02

Note: Continuous variables are presented in mean and their Standard deviations are in parenthesis. Categorical variables are presented in percentage. [a] Significant level at 1%, [b] Significant level at 5%, [c] Significant level at 10%.

2.4.3 Comparing results of one stage/two stage regression models

Figure 2.2 shows that the frequency distribution of observed WTP for PNP of ITT group is skewed to the right as expected and in line with economic theory i.e. when bids increase less people are willing to pay for the proposed service. The stated average WTP for PNP was THB 7135 (SD=5062.4) in the range between THB 0 and THB 25500, with 10.38% of the ITT group not willing to pay anything and a stated WTP mode of 58.1% for THB 5000.

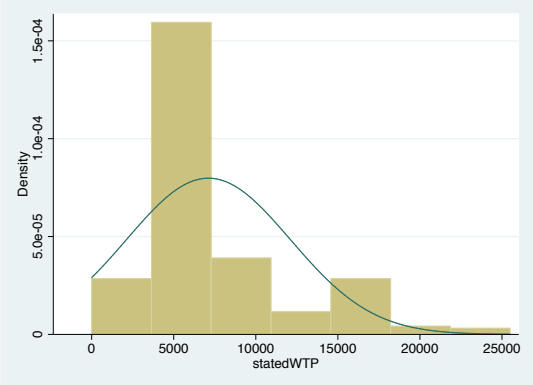


Figure 2.2 Frequency distribution of observed WTP for PNP

Table 2.4 shows the results of one- and two-stage regression models. To start with the one-stage models, IR provides a better performance over TM in term of LL and standard error (σ) of estimation. Furthermore, the sign of all beta coefficients of TM and IR are in the same direction and the *t*-statistic value of each determinant fell in the same confidence interval except for AGE and the size effects of TM's coefficient appeared to be larger than those observed for IR. However, none of the TOT proximal elements was statistically significant ($p > 0.05$). As regards distal elements, INCOME has a positive association with WTP, while AGE. EMP_{GOV} and EMP_{PRI}, have a negative impact on WTP; FEMALE and EDU are not significant ($p > .1$).

Focusing on two-stage models, table 2.4 shows that LL of HSSM is larger than LL of DHM because HSSM employs all observations available for the analysis, while DHM employs information from the ITT group only. As a result, LL is not an appropriate criterion like other criteria such as AIC or BIC because they are calculated taking into account LL, which indicates that DHM is the best model for this data. LL considers sample size and thus this means that the LL of HSSM estimation is likely to be greater than the LL of that obtained from DHM when using the same data set.

In this case the standard error of estimation (σ) can be considered a better criterion of comparison because it indicates the differences between stated WTP for PNP and the expected WTP for PNP predicted by the models. The σ of HSSM was smaller than that observed for DHM and thus parameters estimate of HSSM based on this data set are more appropriate than those obtained from the DHM. With regard to the statistical fit of HSSM, the residuals between selection and outcome models are strongly correlated and have negative significant effects on WTP for PNP (ρ = -.439, x^2= 13.22, p <

.0003). This statistical significance confirms that there is a sample selection bias in the prediction of WTP for PNP, which implies that WTP for PNP of NITT participants may be equal or greater than zero.

Table 2.4 Impact of proximal and distal elements of TOT on WTP for PNP: a comparison of results obtained with HHSM, DHM, TM and IR.

	Two-stage models		One-stage models	
Elements	HSSM	DHM	TM	IR
Model's constants	7239.3[a] (2782.5)	3051.5 (4102.0)	3051.5 (4102.0)	5266.0 (3417.9)
Proximal[A]	1st stage	1st stage		
1st stage's constant	-2.84[a] (.414)	-.561 (.868)	-	-
EVS	.043[a] (.009)	.022 (.016)	100.9 (65.6)	76.3 (56.1)
EVF	-.003 (.011)	.014 (.021)	-65.1 (58.8)	-51.5 (48.2)
AP	.153[b] (.076)	-.070 (.125)	594.7 (441.6)	522.1 (378.5)
PT	.159[a] (.045)	-.051 (.107)	-170.6 (274.0)	-121.9 (230.5)
SN	.150[b] (.060)	.107 (.112)	309.5 (304.5)	261.3 (247.5)
Distal[B]	2nd stage	2nd stage		
FEMALE	669.6 (557.8)	749.6 (604.2)	749.6 (604.2)	684.0 (487.9)
AGE	-76.2[b] (34.8)	-113.2[a] (41.05)	-113.2[a] (41.05)	-84.3[b] (33.5)
INCOME	1057.1[a] (181.7)	1234.7[a] (188.5)	1234.7[a] (188.5)	978.2[a] (155.9)
EDU	110.2 (146.9)	-19.6 (169.3)	-19.6 (169.3)	15.4 (136.1)
EMP_{GOV}	-2571.0[a] (815.9)	-2962.0[a] (875.8)	-2962.0[a] (875.8)	-2442.0[a] (709.2)
EMP_{PRI}	-1854.8[b] (732.8)	-1928.7[b] (759.8)	-1928.7[b] (759.8)	-1658.1[a] (631.6)
λ	-2058.4[a] (575.3)	-	-	-
ρ	-.434[a] (.104)	-	-	-
σ	4742.5[a] (297.8)	4806.9[a] (379.5)	4797.9[a] (287.6)	3788.0[a] (241.8)
Observations	508	260	260	260
Censored obs.	248	27	27	27
Uncensored obs.	260	233	233	233
LL	-2863.7	-2344.0	-2335.8	-408.1
Statistic test	Wald(6) = 64.94	Wald (6) = 52.9	F(11, 249) = 8.17	Wald(11) = 91.4

Note: Standard errors are in parentheses. [a] Significant level at 1%, [b] Significant level at 5%, [c] Significant level at 10%. [A] Proximal predictors in stage 1 of two-stage models; [B] Distal predictors in stage 2 of two-stage models. LL=the log pseudo likelihood and Wald = Wald chi2 test.

Furthermore, in both models the constants are not significant while proximal elements, in comparison to one stage models, have an impact on WTP for PNP but only for the HSSM. The results of the HSSM appear to be in line with Bagozzi's theory. In fact,

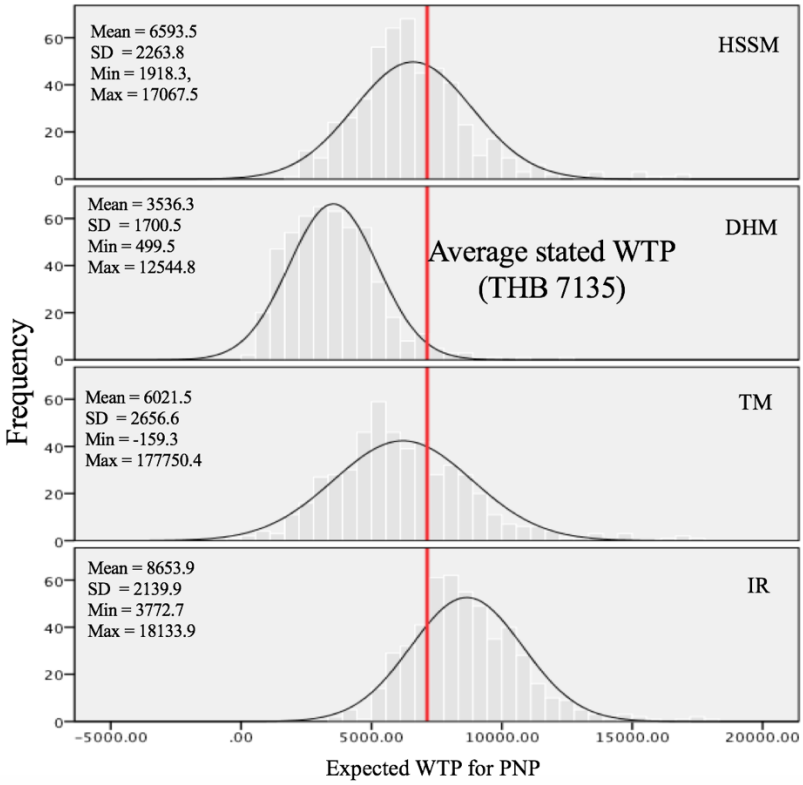
estimates of the HSSM show that EVS, AP, PT and SN influence positively WTP with statistical significance at .05 while EVF is not significant (p>.1) but its sign is as expected i.e. negative.

Table 2.5 Coefficient and marginal effects of proximal elements on ITT and WTP for PNP of the two-stage model

Proximal elements	HSM				DHM	
	Z parameter	p(ITT)	WTP | ITT>0	WTP | p(ITT)	Z parameter	WTP for PNP
EVS	.043[a] (.009)	.015	52.5	124.4	.022 (.016)	31.4
EVF	-.003 (.011)	-.001	-4.4	-10.6	.014 (.021)	20.3
ATP	.145[c] (.075)	.050	175.4	415.7	-.070 (.125)	-99.0
PT	.160[a] (.046)	.055	193.4	458.3	-.051 (.083)	-71.2
SN	.150[b] (.067)	.052	181.3	429.7	.107 (.112)	150.4
Constant	-2.81[a] (.413)				.561 (.868)	

Note: The unit of expected WTP was THB. [a] Significant level at 1%, [b] Significant level at 5%, [c] Significant level at 10%.

Figure 2.3 shows the expected WTP distributions for PNP obtained with these four regression models. All distributions are normally distributed but mean differences were statistically significant differences at the ANOVA one-way test. The comparison of these four distributions shows that the mean of expected WTP predicted by HSSM was the closest to the average stated WTP. The HSSM and TM WTP distributions appear similar, but the TM's prediction has a higher standard deviation than HSSM's prediction. Moreover, although the standard deviations of DHM and IR are smaller than those obtained with the other two models, their expected WTP distributions underestimate and overestimate respectively the average stated WTP for PNP.



Note: Bartlett's test for equal variances: Chi2(3) = 99.3 (p-value= .000)

Figure 2.3 Distributions of expected WTP for PNP predicted by selected models

According to the research question about taking into account bias generated by the sample that is selected to estimate WTP, if we assume that the data set did not have a selection bias and NITT participants were not willing to pay for trying PNP. The missing values of WTP for PNP of original data were replaced with zero. In this case, as regards the procedure of IR, the lower bound of the interval will be considered to have a negative infinity value for the IR estimation. Results in table 2.7 show that HSSM, TM and IR are the models that can deal with the censored data, while DHM cannot distinguish between censored data and censored data to estimate WTP for PNP. The values of the error standards (σ) of the two-stage models were smaller than those observed for one-stage models with HSSM and IR showing respectively the smallest and largest σ.

As regards the TOT proximal predictors in Table 2.6, their impacts on WTP in the HSSM, TM and IR are in the same direction but in different confident intervals for AP and SN i.e. the AP's coefficient of HSSM was significant at 95% of confident interval but the AP's coefficient of TM and IR were significant at 99% of confident interval.

For the DHM, results of EVF, AP and PT show opposite signs in comparison to other models because the model included zero values of stated WTP to predict the expected WTP. For the impacts of distal elements, sign of coefficients of all models (excepted FEMALE) were the same when compared one-by-one element. AGE, INCOME, EMP_{GOV} and EMP_{PRI} were strong significant ($p<.05$). Only FEMALE was non-significant ($p>.1$).

In particular, the results of proximal elements from the HSSM show that EVS, PT and SN have a strong and positive association with ITT and WTP for PNP. Another significant element is AP, but its effect has weak statistical significance ($p < .1$), while also in this case EVF does not influence WTP for PNP. Importantly, only the HSSM provides the decisional stage probability of intention influencing the WTP in the second stage. This probability indicates how much participants intend to try the proposed PNP and how much they will be pay for the programme (see Table 2.5).

Also in this case, we can argue that the two-stage HSSM appears to be the most appropriate model to estimate expectancy value models when combining them with WTP elicited via contingent valuation methods. This model has the advantage of being able to stick the analysis with the conceptual frameworks of expectancy value models (i.e. attitudes-intention-behaviour). Estimations of the HSSM can explore the effects of proximal elements on both intention and behaviour and not only the effects on behaviour as DHM. Owing to the link of proximal elements from the first stage to consumption stage with a mediator in term of intention, the first stage of HSSM can predict the probability of intention from the information of proximal elements.

When taking into account sample bias generated by contingent valuation estimates of WTP, HSSM appears to be a useful technique to evaluate the influence of proximal elements of the TOT on WTP for PNP. The proximal elements' information of NITT group can be included to predict the probability of intention and their WTP for PNP. The marginal effects of proximal elements from HSSM estimation can provide two considerations for the interpretation of their impacts on the WTP for PNP. The first consideration focuses marginal effects on only ITT group that used the uncensored data to predict the WTP for PNP. The second considers the marginal effects based on the probability of ITT to predict the WTP for PNP by using proximal elements' information of all participants predicting ITT probability. Thus, this second consideration provides the way to reach the NITT group.

Table 2.6 Elements' coefficients of TOT on WTP for PNP of HSSM, DHM, TM and IR when replacing the missing value of WTP for PNP with zero

	Two-stage models		One stage models	
Elements	HSSM	DHM	TM	IR
Model's constants	7239.3[a] (2782.5)	-1689.5 (4021.7)	-17526.2[a] (5293.9)	-18865.9[a] (5766.8)
Proximal[A]	1st stage	1st stage		
1st stage's connstant	-2.84[a] (.414)	-2.77[a] (.420)	-	-
EVS	.043[a] (.009)	.043[a] (.009)	273.8[a] (71.3)	3.1.2[a] (75.1)
EVF	-.003 (.011)	.004 (.011)	-40.9 (75.4)	-29.3 (81.8)
ATP	.153[b] (.076)	-.088 (.075)	1136.8[c] (580.8)	1210.5[c] (622.7)
PT	.159[a] (.045)	-.147[a] (.045)	824.2[b] (333.8)	1010.4[a] (362.4)
SN	.150[b] (.060)	.154[b] (.061)	1194.0[a] (393.3)	1342.0[a] (436.6)
Distal[B]	2nd stage	2nd stage		
FEMALE	669.6 (557.8)	588.4 (742.1)	-555.9 (812.9)	-812.9 (893.3)
AGE	-76.2[b] (34.8)	-14.15 (48.4)	-204.1[a] (50.3)	-219.4[a] (55.1)
INCOME	1057.1[a] (181.7)	1025.2[a] (208.2)	1163.2[a] (300.8)	1102.2[a] (319.1)
EDU	110.2 (146.9)	471.9[b] (213.7)	217.9 (236.8)	247.9 (263.7)
EMP_{GOV}	-2571.0[a] (815.9)	-2340.1[b] (907.8)	-3166.7[a] (115.3)	-3077.8[b] (1247.8)
EMP_{PRI}	-1854.8[b] (732.8)	-2340.1[b] (1058.0)	-1942.9[b] (1058.3)	-1895.7 (631.6)
λ	-2058.4[a] (575.3)	-	-	-
ρ	-.434[a] (.104)	-	-	-
σ	4742.5[a] (297.8)	4799.5[a] (382.0)	7926.3[a] (403.9)	8664.1[a] (403.2)
Observations	508	508	508	508
Censored obs.	248	-	275	275
Uncensored obs.	260	-	233	233
Log likelihood	-2863.7	-2572.5	-2582.9	-736.2
Statistic test	Wald(6) = 64.94	Wald(6) = 50.7	F(11, 497) = 12.4	Wald(11) = 151.7

Note: Standard error are in parentheses. [a] Significant level at 1%, [b] Significant level at 5%, [c] Significant level at 10%, [A] the proximal variables are predictors in stage 1 of two-stage models and [B] the distal variables are predictors in stage 2 of two-stage models. LL=the log pseudo likelihood and Wald = Wald chi2 test.

Comparing the results of these four models from Table 2.4 and Table 2.6, we can say that the HSSM two stage models perform better than all other regression models in relation the predictive power of the proximal elements of TOT. This means that the use of one stage models could lead to wrong conclusion about the usefulness of expectancy value models in predicting WTP of a certain good. Secondly, the significant statistical

results of all distal elements appear the same for HSSM, TM and IR at the 95% of the confident interval, but DHM has different results for AGE and EDU.

Finally, to test hypothesis 2 and 3, we investigate whether the analysis conducted via the HSSM could be improved if the collocation of proximal and distal elements of TOT is inverted in the two-stages models. According to results provided in Table 2.7 we confirm the hypothesis that the proximal elements of TOT are indirectly related to state and we accept hypothesis that the distal elements of TOT are also directly related to ITT. Because all proximal elements are not statistically significant in the prediction of WTP for PNP ($p>.1$) while distal elements (excepted FEMALE and EMP_{PRI}) have strong associations with ITT. Thus, in this case results are similar to other regression models. This is an extremely important result because supports the idea that proximal elements of expectancy value models are directly predictors of ITT, which indirectly predict WTP for PNP.

Table 2.7 WTP for PNP of two-stage regression models when including distal elements in stage 1 and proximal elements in stage 2

	Variables	HSSM Coefficients	DHM Coefficients
	Model's constant	5113.8[b] (2454.9)	1199.1 (3758.3)
Outcome model	**Proximal[A]**		
(stage 2)	EVS	52.8 (65.0)	31.1 (87.0)
	EVF	-78.5 (56.0)	-131.2[c] (76.5)
	ATP	572.4 (451.9)	1023.7 (693.8)
	PT	51.3 (272.5)	243.6 (386.3)
	SN	304.1 (283.7)	159.1 (387.4)
Selection model	**Distal[B]**		
(stage 1)	FEMALE	-.113 (.108)	0.346[ns] (.219)
	AGE	-.021[a] (.006)	-0.048[a] (.014)
	INCOME	.123[a] (.047)	0.175[b] (.075)
	EDU	.059[b] (.029)	-0.091 (.065)
	EMP_{GOV}	-.315[b] (.157)	-0.636[b] (.295)
	EMP_{PRI}	-.238[c] (.144)	-0.335 (.295)
	1st stage constant	-.310 (.535)	3.973[a] (1.24)
	λ	-2090.9[a] (578.1)	-
	ρ	-.642[a] (.094)	-
	σ	5625.8[a] (457.6)	5341.0[a] (464.0)
	Observations	508	260
	Censored obs.	248	-
	Uncensored obs.	260	-
	Log likelihood	-2911.7	-2353.2
	Wald chi2(5)	15.25	14.57

Note: Standard error are in parentheses. [a] Significant level at 1%, [b] Significant level at 5%, [c] Significant level at 10%. [ns] non-significant level at 10%. [A] The proximal variables are predictors in stage 2 of two-stage model and [B] the distal variables are predictors in stage 1 of two-stage model.

2.5 Discussion and conclusions

The objective of this study was to identify an appropriate econometric model to estimate expectancy value models when they are combined with studies estimating WTP via contingent valuation methods. The proposed TOT conceptual framework was estimated comparing four regression models: two one-stage regression models (TM and IR) and two two-stage regression models (HSSM and DHM). We used standard error of

estimation to compare these models rather than LL because these models employ different numbers of observations process and different stages in the estimation process.

HSSM appears to be the model for these type of studies for several reasons as highlighted hereafter. HSSM employs data from both ITT and NITT group, while DHM, TM and IR only focus on ITT group because the WTP for PNP in the NITT group is missing. HSSM also provided the second smallest standard error which means that HSSM appears to better than DHM and TM. Moreover, the expected WTP provided by HSSM is the closest to the average stated WTP for PNP, while the expected WTP from DHM and IR underestimated and overestimated the average stated value respectively.

When taking into account sample selection bias to estimate WTP for PNP, empirical results indicated that HSSM had the advantage to explore the impact of proximal and distal determinants on both ITT the proposed PNP and WTP for PNP. The replacement of WTP missing values with zero values indicates that HSSM is the most appropriate regression model because produced the smallest standard error and could stick with the concept of expectancy value models by maintaining ITT as a mediator of the proposed conceptual framework.

Regarding the component of the proposed TOT framework, proximal elements impact on ITT and WTP for PNP only when employing the HSSM corroborating the results of Bagozzi and Warshaw (1990) and those of other similar studies (Bagozzi *et al*. 2004; Xie *et al*. 2008). Alternative regression models used in this study focused on the intention groups and ignored the participants who did not intend to try PNP. The fact that they could not turned to be significant on intention and behaviour is a weakness that has to be considered when employing similar conceptual frameworks. Our results suggest that when behaviour is predicted using the proximal elements via a two-stage model, these elements should be set in the first stage of the estimation to be good predictors of the decision stage (intention). For the distal elements, the results of the Heckman's second-stage are the same as of the other three alternative regression models. Our findings suggest that future studies should include these elements only into the first stage of estimations in order to eliminate problems of endogeneity or high multicollinearity. This is because when intention and behaviour are predicted including the same distal elements in both selection and outcome stages, there is a level of high multicollinearity that may provide poor estimation performance of HSSM or may not

use the full maximum log-likelihood solution when estimating the model (Nawata and Nagase, 1996). However, distal elements may be included in the first stage depending on whether the purpose of the researchers is to explore the impact of these elements on intention or on behaviour. Future research may add other between-individual factors to the list of distal elements in order to directly predict behaviour.

In relation to empirical results of the proposed PNP, younger participants were willing to pay more for PNP than older respondents. They probably have positive attitudes toward the proposed service because it helps to reduce the risk of obesity and related diseases and their health conditions in the long run. Income was also an important predictor of WTP for PNP, which conflicts findings of Lawless et al. (2015) and Bernard and Bernard (2009) probably because the opposite direction may be caused by the fact that this type of service is different. PNP is a new dietary advice that may be attractive to high-income people who can afford to achieve their weight goal and also decrease their health risk. A further explanation is that people who earn a good income are likely to be more concerned with the negative impact of obesity and related diseases (Schmeiser, 2009). The negative significant coefficients of EMP_{GOV} and EMP_{PRI} stressed that employees are willing to pay lower than self-employers. Workers may be less interested in PNP because of the employment rights covering their health, especially government officers. These workers appear to have the lowest WTP compared with others, probably because the government supports their health costs. Moreover, they have access to proper medical care service and will get retirement benefits from the government pension scheme. These can be good reasons why government officers lack motivation for paying PNP, whereas self-employed participants must cover health expenditure by themselves and as a result they might seek a service as PNP to reduce health risk caused by weight problems and related diseases.

Results of the HSSM also show that EVS, AP, PT and SN were strongly positive correlated with ITT and WTP for PNP, while EVF did not influence ITT. This information can be used by policy makers and marketers to motivate people to try PNP. The negative sign of inversed Mill's ratio indicated that WTP for PNP of NITT group is not zero, but it is likely that this group is willing to pay less for trying the PNP in comparison to the ITT group. As a consequence, policy makers and marketers may use these findings to advertise and promote PNP publicly or privately. For example, Thai

government or private health care institutes might invest in the creation of multidisciplinary centres, whilst promote collaboration among doctors, nutritionists and psychologists to offer a PN service. The creation of these centres should be communicated with scientific information campaigns to raise awareness about the possibility of using this technological service to tackle obesity and related diseases. Such social marketing campaign could be based on information remedies, which highlight the successful possibilities of this service to encourage Thai citizens in using the personalised nutrition programme. Furthermore, public or private investments for this service can create job opportunities not only for Thai health care sector but also for national food industry. In fact, new food supply chains might be developed to deliver personalised food in achieving weight goals for Thai citizens. Thai manufactures, retailers and the government might think of innovative supply chains delivering food for weight maintenance or products that offer specific nutritional needs of particular segments of consumer. However, from a policy point of view the decision whether the creation of these centres should be private, or public is an important point of discussion because our results indicate that the private way will be only available to Thai citizens who can afford this service, buy these food products and give a relative importance to health in their utility function. It seems unfair to leave the creation of this service to the law of the market because people are responsible for making unhealthy food choices. If this is the case, our results indicate that only urban Thai people, especially young people, self-employed and high-income people are likely to pay more for the proposed PNP. Thus, there is a demand for PNP as niche market offered to high-class people.

Alternatively, for equity reasons the intervention of the Thai government could be a more promising approach to develop this service on a large scale and protect the most vulnerable categories of citizens. Our findings indicate that the cost of this service is approximately THB 30,000 per six months (GBP 600), which is expensive when we take into account the income of survey's participants. Government may propose a scheme based on the reduction of a corporate income tax to motivate a mixed private/public health PN service on the Thai market. For example, the Thai government might consider including this service in public health programmes not linked to the Universal Healthcare Coverage Scheme where the cost of this service might be subsidised partially in order to attract also Thai citizens who could not afford the service according to WTP estimates obtained from this study. Policy makers might set a

minimum fee for PNP service and subsidise the cost for PN advice. The minimum fee could be set at THB 3,500 per six months or THB 585 per month, which is the expected WTP obtained on the probability of ITT.

To sum up, the Heckman sample selection model appears to be the most appropriate regression model to maintain the integrity of expectancy value models when combined with techniques to elicit and estimate WTP via contingent valuation methods. However, further research should be conducted to enhance the state of art on this interesting and challenging methodological approach and public and/or private acceptance of this health care service to tackle obesity and related diseases.

CHAPTER 3

MODELLING BEHAVIOURAL STABILITY VIA PROXIMAL AND DISTAL CONSTRUCTS OF EXPECTANCY VALUE MODELS: INSIGHTS FROM A LONGITUDINAL CONTINGENT VALUATION STUDY

Abstract

This study explores the behavioural stability of individuals when asked to confirm their willingness to try a new service useful to reach a weight goal. To achieve this objective the theory of trying proposed by Bagozzi and Warshaw was extended and mixed with a contingent valuation study aimed at estimating willingness to pay for a personalised nutrition programme proposed to Thai people.

A longitudinal sample was collected in the area of Bangkok where the same participants were interviewed twice at distance of six months. Willingness to pay for the proposed personalised nutrition programme was elicited using a payment card and estimated employing the Heckman sample selection model. The Heckman sample selection model was used to examine the impact of within- and between- individual factors on stated behaviour by comparing behavioural changes via static and dynamic models.

A matrix of stability was developed to identify latent behavioural patterns. Results show that some groups change behaviour over time while other groups show behavioural stability of intention to try the proposed personalised programme. Implications of these findings are fully discussed in terms of both methodological contribution to these type of studies and usefulness for marketers, policy makers and other stakeholders.

JEL classification: D91

PsycINFO classification: 2229, 3920

Keywords: Intention stability, Expectancy value model, Risk attitudes, Time preferences

3.1 Introduction

Predicting consumer behaviour is an emerging topic for academic researchers and marketers. Recent studies try to explain the differential influence between individual variation and consumer behaviour. This behaviour is investigated by using self-report techniques, which aim at measuring the stated behaviour. This type of investigation asks questions such as: Why do some people buy health products while others do not? Why do some overweight people engage in weight intervention programmes while other overweight people do not? Moreover, it is important to consider the within-individual variation factors of consumer behaviour (Sutton, 2004) asking questions such as: Is an individual's behaviour stable over time? Why do people intend to eat healthy food only on some days or at some meals? It is believed that human behaviours are stimulated by both within-individual factors and between-individual factors. Thus, both within- and between-individual factors are designed to be determinants to explain and predict consumer's stated behaviour.

In this article, we apply a mixed design to investigate: 1) How should within and between predictors be modelled to predict stated behaviour? 2) How do monetary values influence intention to achieve a goal? 3) How stable is stated behaviour and other predictors between two periods? The answers to these questions lead to understand and predict consumer behaviour better, a key element to make decisions for researcher, marketers and policy makers. We develop hypotheses based on the theory of trying (TOT) (Bagozzi and Warshaw (1990), which predicts intention and trying behaviour using the following constructs which represents the proximal elements of their conceptual framework: attitudes, subjective norms, and past behaviour. Proximal elements are the components of the TOT model which influence more close intention to try and subsequently behaviour. Moreover, we extend this model by adding other relevant variables such as risk attitudes and socio-demographic information as distal elements of the proposed conceptual framework. Distal elements are the components of the TOT model which influence intention to perform a certain behaviour indirectly.

To achieve this objective, we propose a simultaneous equation model that examines the effects of proximal and distal constructs on stated preference behaviour via the concept of expectancy value models. Our model is estimated by using field data, which are collected by means of a contingent valuation survey to elicit attitudes and willingness

to pay (WTP) to try a new dietary service, which is still not available on the market. We use the longitudinal data to investigate the variation of within-individual predictors such as attitudes and stability of behavioural intention on WTP between two periods (six-month gap).

Our study intends to be the first study to simulate proximal and distal elements of the Theory of Trying, which predicts the magnitude of behaviour in monetary terms. Furthermore, our proposed model can reveal the probability of intention, which contributes to better explanations and predictions of stated behaviour. Finally, the results from this empirical study provide important insights into what and how within- and between-individual factors influence WTP for a new service.

The remainder of this paper is organised as follows. The relevant literature on expectancy value models and stated behaviour is reviewed and synthesised for the development of our framework to design the proximal and distal constructs of the model and to provide the understanding of the implementation of the simultaneous model. Then the conceptual framework of empirical study will be discussed and incorporated with the paramorphic representation of the proposed model. This will provide understanding on how the proposed determinants influence behaviour and behavioural change. After that, the measurement of proximal and distal determinants and regression results using the data from the CV survey will be described and discussed. Eventually, the discussion and implications of the study will be summarised in the conclusion section.

3.2 Expectancy value model and stated behaviour

Models of social psychology falling under the umbrella of expectancy value models such as the theory of reasoned action, the theory of planned behaviour, the theory of trying (TOT) and so on, have been widely used in social, behavioural and psychological research to understand and explore how attitudes, social norms, beliefs and other latent constructs can predict intention to perform disparate behaviours. Expectancy value models are characterised by the idea that a person's orientation towards a particular course of action is influenced both by the person's belief that the action will lead to a particular outcome and the person's evaluation of that outcome (Sparks *et al*., 1991). These models are also offering economists a unique opportunity to improving the examination of decisional processes by integrating methods of analysis in economics,

which often reduce human behaviour to simplify cognitive models (Earl, 1990; Earl, 2005; Frey and Stutzer, 2007; Alós-Ferrer and Strack, 2014).

Previous studies conducted using expectancy value models show that attitudes and other predictors can predict behaviour reasonably well according to domains of research and methodological aspects to be taken into account when using these conceptual frameworks. For example, a meta-analysis looking at how well attitudes correlated with behaviour across different domains shows that attitudes focusing on problem-solving, drug use, socio-political activities predict behaviour better than attitudes evaluating altruism, family planning, work and religion (Eckes and Six, 1994). Furthermore, attitudes used in these models predict behaviour better when conceptual frameworks take into account the principles of aggregation and correspondence (Fishbein and Ajzen, 2010; Vogel and Wanke, 2016).

People's intention to perform a certain behaviour is a crucial point in these models because independently of how broadly or narrowly a behaviour is defined in terms of target, action, context, and time elements what matters are whether people do or do not perform the behaviour of interest (Fishbein and Ajzen, 2010). Behaviour can be measured in different ways such as using binary scales (Yes/No) to see whether people are willing to perform the behaviour of interest, frequency scales to see how often behaviour is performed and continuous scales to evaluate the magnitude of the behaviour when monetary values are involved (e.g. donation or purchasing behaviour). Sometimes researchers also ask about some specific behaviours and use this information to create an index of the behaviour of interest (Sutton, 2004). To remove environment hurdles, self-report measures are widely used by recalling past behaviours framed under volitional control. However, some behaviours cannot be predicted well if people lack knowledge, skills, opportunities or resources to perform the behaviour. For example, people may intend to buy a new health product, but they cannot own it because the product is not available yet on the market. For this reason, we combine the theory of trying with a contingent valuation study aimed at eliciting willingness to pay (WTP) for a personalised nutrition programme having the intention to help Thai people to change their unhealthy dietary habits.

3.2.1 Theory of Trying

Understanding attitudes, beliefs and behaviours can minimise threats of losing personal control (Hart *et al*., 2009; Chaxel, 2016). Several expectancy value models were applied to explore the power of attitudes on intention toward a relationship with certain behaviour (Sheppard *et al*., 1988; Ajzen, 1991). Regarding goal achievement, one of these models states that "intention" is a significant moderator for decision making and "trying" is a necessary process to achieve the established goal (Bagozzi and Warshaw, 1990). To gain understanding in depth for this idea, Bagozzi and Warshaw (1990) applied the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980) to explain goal-directed behaviours. According to the two key assumptions of TRA: 1) action is a result of a deliberative process based on conscious decision to act, and 2) there is no limitation (i.e. lack of money or ability limitations) when a person tries to act. Bagozzi and Warshaw (1990) argued that many behaviours such as buying a new car, learning new software, and losing weight are considered a goal, which is conditional on limitations and levels of affordability when consumers act toward certain behaviours that are intermediate goals in their performance. In the light of these shortcomings they proposed the theory of trying (TOT) (see Figure 3.1) on the assumptions that consumers know their willpower, which is changeable, and old habits can obstruct maintaining healthy food consumption which is a challenging goal for dieters. Bagozzi and Warshaw (1990) argued that past trying should be a predictor of intention to trying because attitudes are self-generated and influence behaviour partially. When a person feels unclear about their intention to achieve a goal, the frequency of past trying is a decent factor that helps to decide on trying and taking actions. This is because persons will actually perform their acts based on their own PB (Davis and Warshaw, 1992).

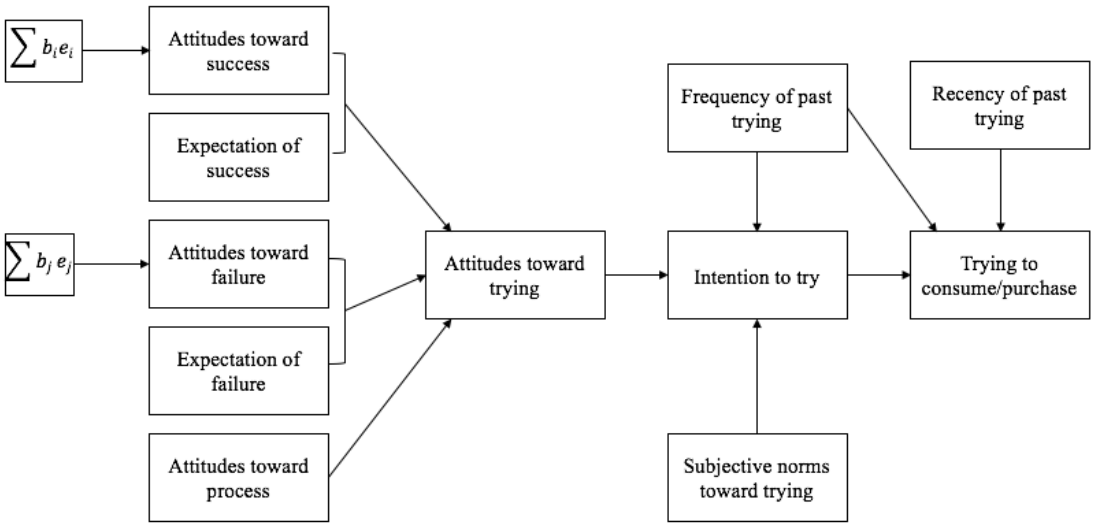


Figure 3.1 The theory of trying (Bagozzi and Warshaw, 1990)

3.2.2 Intention stability

One of the most challenging aspects of expectancy value models is the gap between intention (individual motivation) and decision to perform the intended behaviour that may or may not be real behaviour. Several meta-analysis studies reveal that a substantial gap between intention and behaviour can be observed via intention-behaviour correlation in the range of 0.44 – 0.62 (Ajzen, 2005). Some studies also show strong correlations between intentions and volitional behaviours (0.69 - 0.96) (Sheeran and Orbell, 1998; Sheeran, 2002; Ajzen, 2005). The wider the range of correlation between intention and behaviour, the less power the intention has to predict behaviour (Sutton, 1998; Sheeran, 2002). According to this circumstance, there are many reasons that could provide explanation and justification. The first reason is the limitation of the distinction between goal and behaviour. Sheppard *et al*. (1988) argued that the TRA model is limited to distinguishing goal intention from behavioural intention and is less concerned with an individual's ability to achieve goals considering their circumstances. Although the TPB model (the extended TRA model) adds the perceived behavioural control to predict behaviour, this model does not consider the probability of failing to achieve the intentional goal. For example, consumers may wish to buy a product that is not available in the market or to buy an expensive product such as a new house that they cannot afford. They may look out for a loan, but there is no guarantee that their application will be accepted. This example shows a shortcoming of expectancy value models when the intention is assessed to predict a behaviour dealing with a monetary value.

The second reason is that the different measurement between intention and behaviour will give an unreliable prediction of intention (Sutton, 2004; Fishbein and Ajzen, 2010). For example, stated intention is measured by using seven-point semantic differential rating scale at time-0, but the behaviour is observed and assessed via a dichotomy at time 1. It is difficult to explain all the variations of behaviour from seven categories of intention. Moreover, the time interval between measurement of intention and evaluation of behaviour also affects the validity of intention even though the intention is measured in the same way as behaviour. The longer length of the time interval between two periods, the lower the correlation between intention and behaviour (Sutton, 1998). The longer period increases the probability of new events that may cause a change in intention leading to unstable intention over time. Sheeran *et al*. (1999) confirmed that intention-behaviour relationship is moderated by the temporal stability of intention that can be assessed directly from intention between two periods. They found that during the five-week period, some people retained their intention while some did not.

Previous studies evaluated the stability of intention directly. For example, Bagozzi and Yi (1989), Sheeran *et al*. (1999) and Conner and Godin (2007) measured intention stability from within-participants scores assessed by multiple statements between two-time points. The results of Bagozzi and Yi (1989) show that stability in intention does not influence behaviour. In contrast, Sheeran *et al*. (1999) found that unstable intention cannot predict behaviour, but that stable intention is a strong determinant of behaviour. The results of Sheeran et al. (1999) are consistent with the findings of Conner and Godin (2007). They also found that the degree of intention stability depends on the length of the period between two-time points. The difference of results between Bagozzi and Yi (1989) and Sheeran *et al*. (1999) indicates that the stability in behaviour intention is likely to be a powerful predictor of behaviour when the time interval is greater.

3.2.3 Predicting stated behaviour

To explain and predict health behaviour, it is necessary to understand how within-individual factors (e.g. intention stability) and between-individual factors (e.g. socio-demographic information) influence behaviour and behavioural change (Sutton, 2004). Sutton (2004) pointed out that time lag is an important factor explaining the intention-behaviour relationship via introducing several models to predict behaviour. He

suggested that the explanation and prediction of health behaviour will be improved by using two-level or mixed designs. The mixed design can explain both within-individual and between-individual stages. The mixed design can also estimate the impact of intention on behaviour both within an individual and between individuals. However, both within-individual design and mixed designs are rarely conducted by using expectancy value models in the field of health behaviour (Sutton, 2004). Moreover, causal models representing attitude-intention-behaviour relation at the between-individual level ignore other relevant variables such as gender, income, risk attitudes and time preferences that may affect behavioural change.

3.2.4 Proposed distal elements predicting behaviour

Despite the fact that the TOT frames an outstanding conceptualisation of useful mechanisms for goal trying, making decisions to purchase or to try a product deals with both financial and time constraints (Xie *et al*., 2008). However, TOT is similar to other expectancy value models that do not rule out other social determinants of behaviour. The intention function captures noneconomic predictors influencing trying as the key proximal variable to mediate the relationship between other proximal determinants and behaviour. Many other factors such as socio-economic and demographic variables and economic attitudes are ignored, but these factors may influence behaviours as well (Sutton, 2004). In this study, in order to fill such a gap we assume that, as well as socio-economic and demographic variables, risk attitudes and time preferences can be relevant distal elements of TOT because they influence WTP (purchasing behaviour) directly.

In the field of economics, when considering risk, uncertainty and time value of money, risk attitudes and time preferences are paramount to understand consumers preferences involving trade-offs that people make between short-term gratifications and long-term benefits.

Several studies have linked risk attitudes to health behaviours and outcomes (Anderson and Mellor, 2008; de Oliveira *et al*., 2015). For example, a person who is more risk averse is less likely to be overweight or obese than people who are low risk averse (Ikeda *et al*., 2010; Sutter *et al*., 2013; de Oliveira *et al*., 2015). According to Picone *et al*. (2004), risk-averse people are willing to undertake an early detection of cancers. This implies that risk-averse people are more concerned about health risks and

uncertain about the incidence of illness than risk-seeking people. They are willing to invest in health services and products for their longevity (Dardanoni and Wagstaff, 1990; Picone *et al*., 2004). Based on this literature, we hypothesise that high risk aversion has a positive relationship with the purchasing health products such as a new service based on the concept of personal nutrition explored in this study.

As regards time preferences, past studies indicate that inability to suspend gratification of consumers and impatient time preferences were considered good predictors of individual decision making and health outcomes, especially those connected with obesity (Heshmat, 2006; Leonard *et al*., 2013; Courtemanche *et al*., 2015; de Oliveira *et al*., 2015). This is because time preferences can explain eating habits and food choices that overweight and obese persons made in the past. Although impatient people are concerned about behaviour that may bring about future health benefits, they tend to ignore the immediate and the future costs of their current behaviour because low food prices (Leonard *et al*., 2013), act as an incentive to overconsumption (Courtemanche *et al*., 2015). Moreover, time preferences are an important predictor of the demand for health investment that is included into health human capital model (Grossman, 1972). Patient people expect a long life, and therefore, they will potentially invest more in healthy products (Ehrlich and Chuma, 1990) and tend to seek for early detection of diseases, i.e. cancer screening or cholesterol testing more than impatient people (Picone *et al*., 2004; Bradford, 2010).

Finally, socio-economic and demographic determinants such as age, income, gender, education and employment are between-individual factors that represent the quantity and quality of access to both monetary and non-monetary resources provided by society (Raphael, 2011; Ruckert and Labonté, 2014). Particularly, these factors present inequitable distribution of society shape influencing consumer behaviours and health (Ruckert and Labonté, 2014). They generally enter all models and their findings in this specific context can provide public policy recommendations to reshape and change consumer's health behaviours (i.e. buying health products).

3.3 Empirical study

The empirical study focused on people who were willing to set weight goals during a 6-month period. In the first survey (T_0), participants were asked to set their weight goal by using one the following statements: 'To stay about the same weight', 'To lose

weight', or 'To gain weight'. Then the scenario of the Personalised Nutrition Programme (PNP) was presented via a card illustrating the PNP process (see Appendix A) Participants were informed about the personalised nutrition concept and how PNP could help them to achieve their weight goal and minimise the risk of diseases relating to unhealthy dietary habits. After that, participants had to convey intention to try the PNP, express their willingness to pay (WTP) for the PNP. Then, participants were also required to evaluate the attitudes, subjective norms, past trying toward trying if following the PNP, to elicit their risk attitudes and their rate of time preferences (see appendix A).

Finally, the interviewers asked participants to fill their personal information (i.e. age, gender, education level, income, type of employment, weight, height). Six months later, interviewers followed up the participants who had committed to participate in the second survey (T_1), which was processed in the same way as T_0. The scenario of PNP was presented via PNP scenario card to ask participants about expressing their intention, WTP for PNP, risk attitudes and time preferences as same as at T_0.

Figure 3.2 shows the conceptual framework used in the empirical study, where Part A shows the traditional elements of TOT and Part B shows the extended components developed by this study. Accordingly, Part A shows the proximal components of the model and indicates that the higher the attitudes towards success (EVS) and process (AP), the higher is the intention to achieve weight loss goals using the proposed PNP. While for attitudes towards failure (EVF), the higher the scores, the lower is the intention to lose weight. Part A also shows that subjective norms (SN) influence positively ITT for PNP when persons are encouraged by referencing groups toward healthier lifestyle. Part B shows the distal or extended elements of the model and illustrates that in this specific context ITT can be influenced by risk attitudes, time preferences, body mass index and socio-economic characteristics of participants. Part A and Part B are linked by ITT and WTP for the proposed PNP to help participants to achieve weight goals. As a result, the questionnaire was developed and divided into three sections to measure the proximal and distal elements of the extended conceptual framework of TOT and WTP for the PNP.

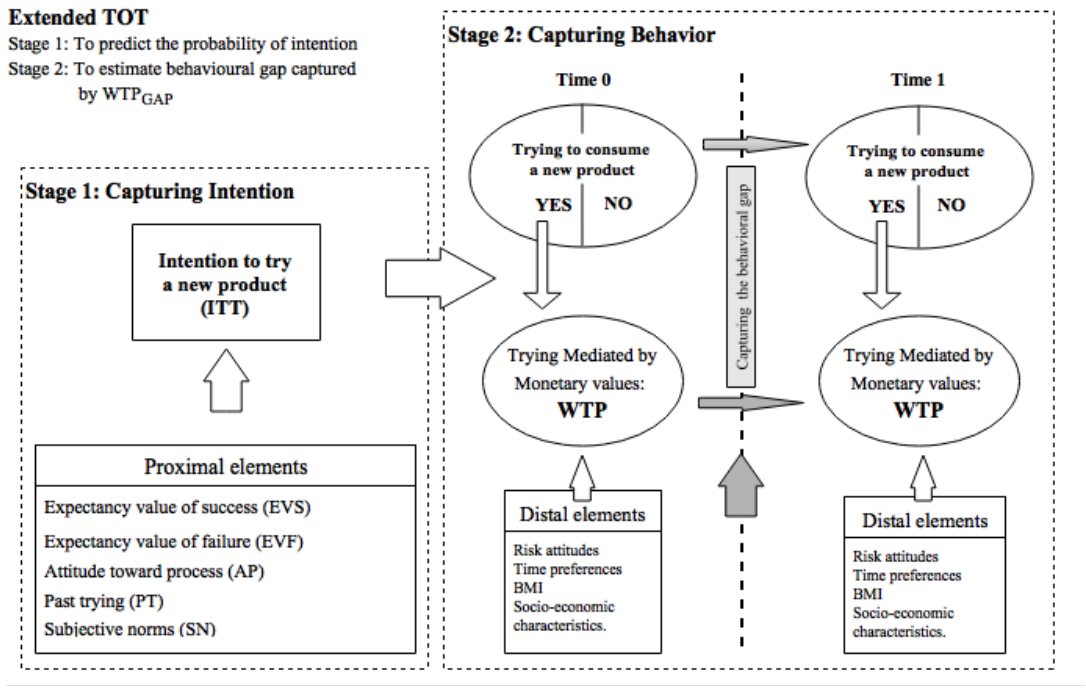


Figure 3.2 Proximal and distal elements of the extended TOT framework

3.4 Measurement of the elements of the TOT and modelling behavioural stability

3.4.1 Measurement of proximal elements

Attitudes were measured according to the theoretical framework proposed by Bagozzi and Warshaw (1990). EVS and EVF were measured using expectancy values scores while AP with a global measure of attitudes. For example, the value component (AS) of EVS was elicited by asking participants to answer the following statement "When people diet some succeed and some fail. If you are trying the proposed PNP and during the next six months you succeed to achieve your weight goal, this would make you feel" (1 = extremely unpleasant, 7 = extremely pleasant). The belief component (ES) of EVS was elicited by asking participants "Assuming I try to follow the PNP during the next six months, it is likely/unlikely that I would succeed to achieve my goal" (1=extremely unlikely, 7=extremely likely). This approach was also used to measure EVFL component of the TOT model, while AP was elicited by asking participants how much they would enjoy enrolling on the PNP during the next six months (1 = unenjoyable, 7 = extremely enjoyable). SN was elicited by asking participants "Most people who are important to you express approval or disapproval of your activities.

Please tell us whether these people would approve or disapprove if you follow the proposed PNP during the next six months" (1 = totally disapprove, 7 = completely approve). Past trying behaviours were instead captured by asking participants to indicate the frequency of past trying to control their weight (1 = never, 6 = very many times).

3.4.2 Measurement of distal elements

Risk attitudes (RISK) were elicited by using the larger-gain format of the SGG lottery-panel test (Sabater-Grande and Georgantzis, 2002). The SGG lottery-panel test considers both effects of large stakes and mixed outcome lotteries. The lottery contains four panels, and each panel has ten lotteries including a possibility to earn THB100 for sure. Each lottery also presents the probability of winning nothing. Participants were required to choose one lottery in each panel. The result of this lottery divided participants into two groups: risk seeker and risk-averse. The payoff of each lottery was constructed by using the rule:

$$E(Lot_{lk}) = pw_{lk} * rew_{lk} = cer_k + (1 - pw_{lk}) * rp_k \quad (1)$$

Thus, the payoff was calculated by:

$$rew_{lk} = [cer_k + (1 - pw_{lk}) * rp_k]/pw_{lk} \quad (2)$$

Where $E(Lot_{lk})$ is the expected value of lottery l ($k \in \{1, 2, 3, \dots, 10\}$) in panel k ($k \in \{1, 2, 3, 4\}$). The parameter rew is a payoff and the parameter pw is a probability of winning. The parameter cer_k is a constant amount of money fixed at THB100. The parameter rp_k is a specific risk premium in panel k given ($rp_k \in \{0.001, 100, 500, 1000\}$). In the same panel, the expected value of lotteries increased from safer to riskier choices. All panels start with 100% chance of winning THB100 and decrease the winning probabilities to 10% in the lottery 10, while stakes increased. Panel increments are larger moving from panel 1 to panel 4 by increasing risk premium.

The elicitation format of this lottery allows participants to be classified as either a risk seeker or a risk-averse individual. Risk-averse participants tend to choose a lottery closer to the left-hand side of the panel, while risk seekers or risk neutral participants choose values of the lottery closer to the right of the panel. The RISK was calculated from the average probability of all panels to represent participants' risk aversion level.

Time preferences (TIME) were measured by asking participants to indicate their preferences for receiving THB10,000 now and receiving the money later for a larger amount. The returning rate started from 10% of the initial money and increased every 10% up to 100% (THB20,000). When participants select THB10,000 for all choices, they were asked to state their preferred amount for one year after. The first switching point from immediate receiving to delayed receiving was the preferred return rate and thus the distal predictor of WTP for PNP.

The Body Mass Index change (ΔBMI) was obtained subtracting BMI at T_1 from BMI at T_0. This study calculated BMI (unit: kg/m^2) from subjective weight and height. Participants were asked to state their weight and height in the questionnaire. Although self-reported dispositions may bias, Sutin (2013) confirmed that reported weight and height are highly correlated with measured weight and height (r=0.98 and r=0.92, respectively). Moreover, Lim *et al*. (2009) found high correlation between self-reported and measured anthropometric among male and female in Thailand. Although they found the significance of the discrepancy between self-reported mean and measured mean both weight and height, the difference between self-reported mean and measured mean is less than one kilogram of weight and two centimetres for height. These discrepancies are very small especially in terms of weight because weight always fluctuates day to day depending on when and how it was measured. For example, in the morning our weight will be less than in the evening. However, self-reported measurement can make participants' feeling more comfortable than measured method.

The questionnaire also included a set of questions related to socio-demographic characteristics of participants such as gender, age, income, education and employment.

3.4.3 Modelling behavioural stability

This study captures trying behaviour in the context of WTP for PNP, which is elicited via a payment card. According to previous research, the Tobit model (TM) has been widely accepted to estimate WTP, when the responses have large numbers of zero bids (Halstead *et al*., 1991). This model deals with both censored and uncensored observations, whereas the traditional model – Ordinary least square (OLS) - estimated only a censored sample (Norris and Batie, 1987). Thus, the function of WTP for PNP can be expressed based on TM by using an underlying latent variable following:

$$WTP_i^* = \begin{cases} x_i'\beta + \mu_i & \text{if } x_i'\beta + \mu_i > 0 \\ 0 & \text{if } x_i'\beta + \mu_i \leq 0 \end{cases} \quad , i = 1, 2, \ldots, N \tag{3}$$

Where WTP_i^* is the latent variable assumed censored when observed WTP_i equal zero or below, and remain uncensored when observed WTP (WTP_i) is positive value. β is the parameter vector of observed characteristics and N is number of observations. μ_i is the error term, which are normal distribution ($\mu_i \sim N(0, \sigma^2)$)

However, the estimated WTP with the Tobit approach, in this case, appears to be a biased prediction owing to sample truncation arise (Heckman, 1974; McDonald and Moffitt, 1980). This is because observed WTP has missing value problems when participants decide not to intend to try the PNP. It should not be assumed that the missing WTP information for NITT group equals zero.

Thus, observed WTP (WTP_i) is collected when a participant expressed intention to try the PNP (ITT_i = 1). So, the condition of observed WTP is

$$WTP_i = \begin{cases} WTP_i^* & if \quad ITT_i = 1 \\ 0 & otherwise \end{cases} \tag{4}$$

According to Sheppard *et al*. (1988), consumer's intention to purchase services may involve limits on consumer's actions, especially a new service. In this study, the proposed PNP programme is a new service which diagnoses at genotype level health risks linked to dietary habits. Although this study applies the contingent valuation survey to introduce this service, it may be not sufficient to provide all service's information as much as their demand and consumers may not trust it. Consistent with the suggestion of McDonald and Moffitt (1980), the Heckman Selection Model (HSSM) (Type II Tobit model) is an appropriate method to estimate WTP, when faced with both the sample selection bias and a limit value of response variable problems (Heckman, 1974). Owing to equation 2, observed WTP was missing when participants stated no intention to try the PNP. It means that WTP observations are selected to estimate the WTP for PNP. As a result, the probit probability of ITT function is derived below (see eq. 5) to deal with sample selection bias on WTP function.

According to an assumption of HSSM, the dependent variable of the first stage represents the consumer decision that directly influences consumer behaviour denoted as the dependent variable of the outcome model. In expectancy value models, this dependent variable can be identified in consumer decision elicited by intention context

to mediate the relationship between social-cognitive determinants and behaviour. According to Bagozzi and Warshaw (1990), in the TOT, the attitude-behaviour relationship is framed to explain the influence of proximal components on trying to reach a goal through intention as well. To simplify the measurement of intention and minimise variation of the relationship between intention and behaviour, this study uses a dichotomous measure of intention to predict behaviour, i.e. WTP for the PNP (Sutton, 2004). Thus, the first step of the estimation procedure explores how the proximal TOT components influence ITT for PNP. This step is performed using a standard probit regression with linearly observed proximal variables as follows:

$$ITT_i^* = z_i'\gamma + \nu_i \tag{5}$$

Where ITT_i^* is the latent variable of intention toward trying the PNP for participant i and z_i' represents is the vector of observed proximal components (γ) of the TOT including EVS, EVF, AP, PT and SN. ν_i is the error term, which are normal distribution ($\nu_i \sim N(0, \sigma^2)$). Consequently, the outcome model of the second stage is captured by the following equation (6):

$$\begin{aligned} E(WTP_i|x_i, z_i) &= E(WTP_i^*|ITT_i = 1, x_i, z_i) \\ &= x_i'\beta + \rho\sigma_\mu \frac{\emptyset(z_i'\gamma)}{\Phi(z_i'\gamma)} \\ &= x_i'\beta + \rho\sigma_\mu \lambda(z_i'\gamma) \end{aligned} \tag{6}$$

Given $\beta_\lambda = \rho\sigma_\mu$ and $\alpha_\nu = (0 - z_i\gamma)/\sigma_\nu$, $\lambda(\alpha_\nu) \equiv \frac{\emptyset(z_i'\gamma)}{\Phi(z_i'\gamma)}$ represents inversed Mills ratio. If the correlation between μ_i and $\nu_i$is zero (ρ=0), there is no sample selection bias in the prediction of WTP. Thus, the expected WTP equal $x_i'\beta$. When the probability of ITT is positive (ITT=1), the expected WTP model for observed values of WTP can be expressed below:

$$E(WTP_i|ITT_i^* > 0) = x_i'\beta + \beta_\lambda \lambda(\alpha_\nu) \tag{7}$$

Equation 6 and 7 can be estimated by two approaches as a two-step model and a maximum log-likelihood solution (MLE). Heckman (1979) developed the two-step model to separate estimation between selection model and outcome model. The first step estimates a standard probit regression for selection to obtain the inverse of the mills ratio (λ) for each observation. Then an OLS regression is estimated for equation 7 by adding λ as a predictor of expected WTP. However, Nawata and Nagase (1996)

claimed that two-step estimator may perform poorly and suggested using the MLE approach via econometric software package programmes such as LIMDEP and STATA. This method will produce more efficient estimates, but the MLE results may not be correct or may have poor performance if the parameter ρ is close to ± 1 and there is a high multicollinearity degree between x_i' and z_i' (Nawata and Nagase, 1996). Moreover, they noted that the HSSM will perform well and reasonably to use MLE estimation if predictors of the outcome model differ from the selection model. There is no doubt that the full MLE approach is an appropriate to estimates the impacts of proximal and distal components of TOT on WTP for the proposed PNP.

To investigate the impact of the behavioural gap, proximal and distal elements on regular behaviour dealing with trying to achieve a weight goal, this study assumes that: 1) a change in one of the proximal elements influences changes in behaviour and there is no reciprocal causation between proximal determinants and behaviour relationship; 2) proximal elements are exogenous factors not affected by any distal elements; 3) distal elements directly influence behaviour; and 4) a person behaves the way she does because the person intends to do so and does not do whatever the person does not intend to do. Owing to a long period of time, proximal elements may change over time and there may be less power to predict behaviour during the follow-up period. Thus, the analysis focuses on the current correlation between proximal elements and behaviour regarding past causal processes. As this study applies a contingent valuation method to elicit intention and WTP for PNP, participants did not engage in the real situation and decision making. Intention to try the PNP possibly changes later (Sutton, 1998). The consistency of intention between two periods will be added to be a predictor of WTP for PNP. This variable represents the stability of intentions and explores the influence of the intention-behaviour gap on average and different behaviour between two periods. The hypothesis of this study follows:

H1: If there is selection bias in the prediction of behaviour, the impacts of proximal elements on intention are likely to lie in the same directions for behaviour.

H2: When behaviour is not constant over time, this may lead to an expansion of the magnitude of intention-behaviour gap between two periods. The degree consistency of intention will matter to determine the effects of average behaviour. A person who has unstable intention is less likely to be lower WTP for PNP.

To test hypothesis 1 and 2 with empirical data, equation 7 will be estimated by using information at baseline survey (T_0) for Model 1, and using information at a follow-up time point (T_1) for Model 2. In order to investigate the impact of intention stability on behaviour, we focus on only ITT group to investigate the stability. Model 3 will capture the average of information betweenT_0 and T_1. The stability of intention is measured by dichotomy to classify participants into two groups. Participants who expressed intention to try the PNP in both interviews were categorised into stable ITT group (ITT_{STABLE} = 1), and participants who expressed intention at T_0 or T_1 only were categorised into not unstable ITT group (ITT_{STABLE} = 0). Therefore, the expected WTP for PNP function in equation 5 is developed and can be expressed in equation 10.

$$WTP_{MID} = (WTP_0 + WTP_1)/2 \tag{8}$$

$$E(WTP_{MID}|x_i, z_i) = \beta_{STABLE} ITT_{STABLE} + \beta x'_{ai} + \rho\sigma_\mu \lambda(z'_{ai}\gamma) \tag{9}$$

Given WTP_{MID} is the mean of WTP for PNP between T_0 and T_1, WTP_0 represents observed WTP at baseline survey and WTP_1 represents observed WTP at follow-up time point. In equation (9), ITT_{STABLE} is the dummy variable of ITT stability, β_{STABLE} are parameters of stable ITT, x'_{ai} is the vector of average of distal variables between T_0 and T_1, and z'_{ai} is the vector of average of proximal variables between T_0 and T_1.

According to the proposed conceptual framework, the proximal and distal elements are likely to predict the behaviour on the basis of the behavioural gap i.e. the consequence of a change in behaviour from T_0 to T_1. To explore the impacts of proximal and distal elements, and stability intention on the behavioural change, Model 4 will be tested based on the two last hypotheses of the study which are:

H3: If there is selection bias in the prediction of behavioural change, the impacts of proximal elements on intention are likely to lie in the same directions for behaviour change.

H4: If the degree of intention stability matters to determine effective behaviour, then this will determine the behavioural change. A person who has weak intention is more likely to have a negative change in WTP for PNP from the baseline.

To test the above hypotheses, the equation 9 will use the difference between information at T_0 and T_1. As a result, Model 4 will be estimated following equation 11.

$$\Delta WTP = WTP_1 - WTP_0 \tag{10}$$

$$E(\Delta WTP|x_i, z_i) = \beta_{STABLE} ITT_{STABLE} + \beta x'_{ci} + \rho\sigma_\mu \lambda(z'_{ci}\gamma) \quad (11)$$

Given ΔWTP is the difference of stated WTP for PNP between T_0 and T_1, x'_{ci} is the vector of difference of distal variables between T_0 and T_1 (T_1 - T_0), while, z'_{ai} is the vector of difference of proximal variables between T_0 and T_1 (T_1 - T_0).

3.5 Data collection

597 volunteers were recruited in Bangkok by advertising the study in a number of small businesses, large companies and government offices. Participants who agreed to take part in the study were interviewed face-to-face at the Centre for Applied Economics Research of Kasetsart University between November and December 2015. Only sixty-three participants were not willing to participate in the second phase (six-month period). The research study was designed and conducted in compliance with the ethical guideline of the University of Reading. The questionnaire was translated into Thai and evaluated in pilot studies three times. The two first pilots aimed to test the balancing language by asking seven volunteers, who can communicate both in Thai and English. The final pilot evaluated the revised version by asking twenty-eight volunteers. In the second phase of data collection, 89 participants (14.9%) were absented to follow up for three reasons: not willing to participate in the research for the second survey (n=63), moving workplace to other provinces (n=5), no contact information at follow-up (n=21). Finally, 508 participants were willing to participate in the second survey.

3.6 Empirical results

3.6.1 Socio-demographic and psychographic characteristic of participants

Results show that the majority of participants were women (60.3%) and educated at university level (69.2%) and with a gross monthly income between THB 10,000 and THB 30,000 (65.7%). Although the sample might look biased about education, this result reflects the current situation in the Bangkok area where about 96% of people have at least an undergraduate degree. Thus, researchers made an effort to oversample people who are not having a degree when recruiting. The age of participants ranged from17 to 74 years with an average age of 32 (SD =10.08) and with 48.4% of participants working for private companies, 30.3% for governmental organisations and 21.2% running their

own businesses. The analysis of the stated BMI showed that 39.9% of participants was normal weight, 31.5% was overweight, and 18.1% was obese.

According to the overall intention to try the proposed PNP, Table 3.1 presents the decision of participants expressing their intention to try PNP at T_0 and T_1. From two periods, three-fourths of participants were willing to try PNP to achieve their weight goal. In the ITT group, there was 53.80% expressing strong ITT both T_0 and T_1 and the rest were unstable ITT that preferred to try only for one period (T_0 or T_1).

Table 3.1 Matrix of intention stability

		Time 0		
		Non-intention	Intended	Total
Time 1	Non-intended	127	121	248
	Intended	55	205	260
	Total	182	326	508

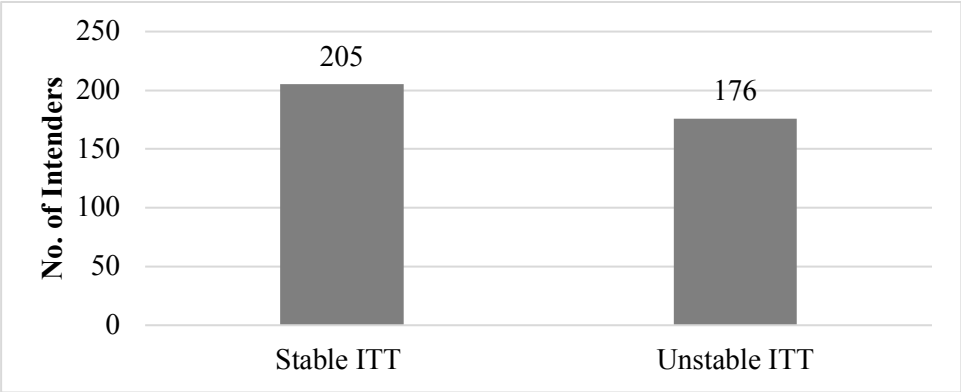


Figure 3.3 Comparision of stable ITT and untable ITT

3.6.2 Overview of empirical study

The empirical study will show four models to demonstrate how HSSM predicts consumer behaviours in terms of WTP through TOT framework. All models were estimated by MLE and adjusted to specification for heteroscedasticity and non-normality. The two first models were estimated following equation 7 to present how the proposed conceptual framework explores impacts of proximal and distal determinants on WTP. The results of cross-sectional data at T_0 are reported by Model 1 and the results of cross-sectional data at T_1 are reported by Model 2. Model 3 provides

further evidence of using the proposed modelling (equation 9) to investigate the impacts of stability intention, proximal and distal elements of TOT on the average of WTP between baseline and follow-up periods. The final model is estimated by equation 11 to present additional evidence exploring the influence of stability intention, proximal and distal elements of TOT on WTP change from baseline. The estimation of model 3 and 4 was employed using the longitudinal data to capture stability in intention and the WTP for PNP at T_0 and T_1. All estimations use the proposed proximal and distal variables to explain variations in intention and WTP for PNP:

EVS: average expectancy score of attitude toward success

EVF: average expectancy score of attitude toward failure

AP: rate of attitude toward process in the range of 1-7

PT: frequency of past trying in the range of 1-7

SN: rate of subjective norms in the range of 1-7

ITT_{STABLE}: 1 if the participant is stable ITT, 0 if the participant is unstable ITT

RISK: average selected winning probability of all panels (Unit: percentage)

TIME: rate of time preference (Unit: percentage)

FEMALE: 1 if the participant is female, 0 otherwise

AGE: age of the participant

INCOME: monthly income of the participant (1= less than or equal THB1000, 2 = 10001 – 20000, 3 = 20001 – 30000, 4 = 30001 – 40000, 5 = 40001 – 50000, 6 = 50001 – 60000, 7 = 60001 – 70000, 8 = 70001 – 80000, 9 = 80001 – 90000, 10 = 90001 – 100000, 11 = more than 100000). THB53 is approximately 1 GBP (average conversion in December 2015)

EDU: years of education

EMP_{GOV}: 1 if the participant works for public organisation, 0 otherwise

EMP_{PRI}: 1 if the participant works for private company, 0 otherwise

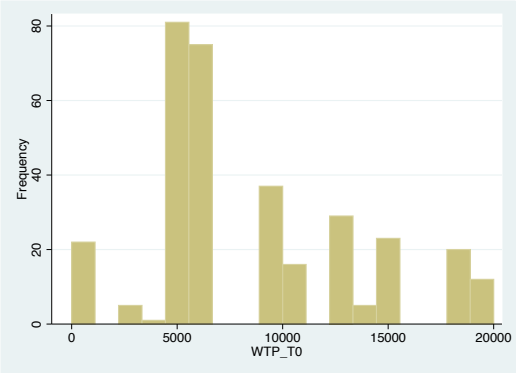
BMI_C: difference BMI between T_0 and T_1

DRINKING: 1 if the participant drinks alcohol, 0 otherwise

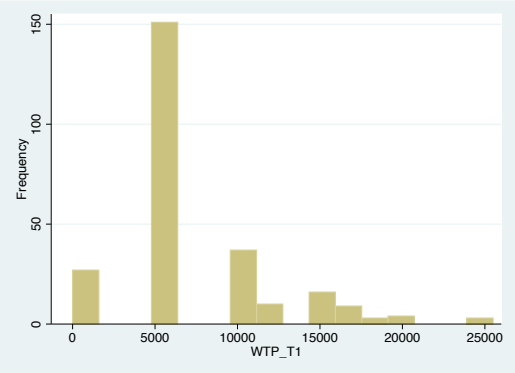
SMOKING: 1 if the participant smokes, 0 otherwise

3.6.3 Impacts of stability trying intention, proximal and distal constructs on WTP for PNP

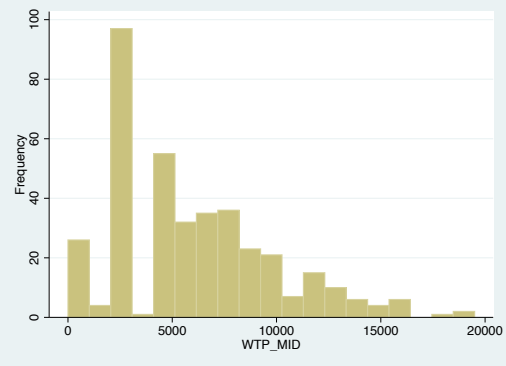
Distributions of WTP at T_0 and T_1. In Figure 3.4, the frequency distributions of observed WTP at T_0 and T_1 have positive skew leading to positive skewness in WTP_{MID}. The average of WTP_{MID} is THB 6048.3 (SD_{MID} = THB3868.4) ranging from THB 0 to THB 19500 and its mode is THB 2500 (17.8% of ITT group). While the frequency distributions of observed ΔWTP is normally distributed, the kurtosis for this variable is 2.84. The results of descriptive statistics indicate that the average of ΔWTP is THB -2359.2 (SD_{CHG} = THB 7605.2) ranging from THB -20000 to THB 19000. 16.8% of ITT participants did not change their WTP for the PNP ($\Delta WTP = 0$) and 55% of ITT participants were willing to pay less than the participants in the first observation.



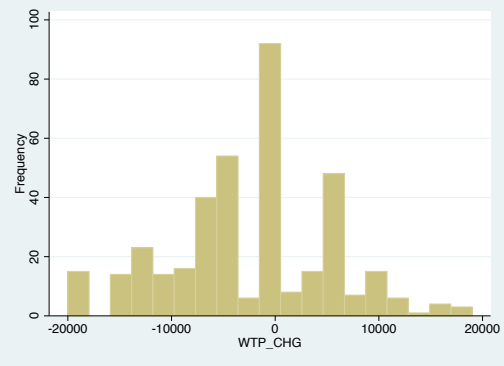
5a: WTP_{T_0} distribution



5a: WTP_{T_1} distribution



5c: WTP_{MID} distribution



5d: ΔWTP distribution

Figure 3.4 Distribution of WTP for PNP

Regression estimations. The marginal effects of proximal and distal elements of TOT on WTP for PNP are shown in Table 3.2. The results show that all x^2 values for

correlation coefficients (ρ) of all models have negative signs and are statistically significant. These values confirm the sample selection bias in the prediction of WTPs for PNP and the intention to trying PNP impacts WTP positively. Starting with the static simulations at T_0 and T_1 of models one and two, most variables perform more or less similarly in terms of direction and significance level excepting PT, RISK, EMP_{GOV} and EMP_{PRI} that have strong association with WTP for PNP for Model 2 only. The marginal effects of all variables for Model 2 appear greater than Model 1. Moreover, the results of Model 2 appear to be similar to those of Model 3 that is simulated by the average information of each variable between T_0 and T_1. RISK is strongly and positively associated with WTP ($p < .01$). When the probability of RISK increases by one, WTP for the ITT group increases by approximately THB 10. This means that a high risk averse person is willing to pay for a PNP more than a low risk averse person.

ITT_{STABLE} is positive and has strong statistical significance in both Model 3 and Model 4. It indicates that participants who strongly intended to try the PNP were willing to pay more than participants who did not have strong intention. Further interesting results are that RISK and AGE do not impact the change in WTP for PNP, while TIME has a strong effect on such change. The negative relationship between TIME and WTP ($p < .05$) indicates that participants who decrease TIME from the baseline were likely to increase WTP for PNP during the follow-up period.

Table 3.2 Marginal effects of proximal and distal elements of TOT on WTP for PNP

	Model 1: Prediction at time 0 << eq.7 >>		Model 2: Prediction at time 1 << eq.7 >>		Model 3: Average between time 0 and time1 << eq.9 >>		Model 4: Difference between time 0 and time1 << eq.11 >>	
Dependent variable	WTP_{T_0}		WTP_{T_1}		WTP_{MID}		ΔWTP	
Proximal variables	WTP|ITT>0	WTP| p(ITT)	WTP|ITT>0	WTP| p(ITT)	WTP|ITT>0	WTP| p(ITT)	WTP|ITT>0	WTP| p(ITT)
EVS	15.3***	79.3***	53.5***	129.5***	15.8***	72.2***	31.0	15.5
EVF	-2.0	-10.4	-6.3	-15.4	6.5	29.5	-55.2*	-27.7*
AP	164.9***	851.6***	173.6*	419.7*	114.9***	522.7***	257.4	129.3
PT	26.35	136.0	164.5***	397.6***	48.1*	218.9*	35.5	17.8
SN	125.1***	645.8***	188.7***	456.1***	85.2***	387.7***	136.9	68.7
Distal variables	Beta / WTP|ITT>0	WTP| p(ITT)	Beta / WTP|ITT>0	WTP| p(ITT)	Beta / WTP|ITT>0	WTP| p(ITT)	Beta / WTP|ITT>0	WTP| p(ITT)
RISK	11.6	7.4	22.6**	11.5***	15.3**	11.8**	17.4	12.9
TIME	.37	.23	- 4.1	-2.1	.132	.102	-5.0**	-3.7**
FEMALE	232.9	149.2	620.6	315.8	459.2	355.8	-436.8	-324.6
AGE	-84.5**	-54.1**	-68.0**	-34.6**	-51.9***	-40.2***	-21.7	-16.1
INCOME	486.2***	311.5***	1096.5***	558.0***	604.4***	468.3***	1179.3***	876.4***
EDU	-189.9	-121.6	86.3	43.9	-54.5	-42.2	227.4	169.0
BMI	5.12	3.2	-5.9	-3.0	-7.5	-5.8	163.0	121.2
EMP_{GOV}	-843.0	-540.1	-2552.7***	-1299.1***	-1217.4**	-943.2**	-1964.4*	-1459.8*
EMP_{PRI}	-711.6	-456.0	-1771.4**	-901.5**	-920.4**	-713.1**	-1497.9	-1113.3
ITT_{STABLE}	-	-	-	-	3872.1***	3000.0***	2080.0**	1545.7**
Constant	13040.3***		6440.6*		8906.8***		-5018.9	
Rho (x^2)	- .232* (2.96)		- .439*** (10.68)		-.314** (4.35)		-.850*** (23.11)	
sigma	5010.6***		4674.0***		3151.0***		8725.7	
lambda	-1166.6		-1933.2		-989.9		-7421.1	
Log pseudo likelihood	-3537.2		-2862.9		-3860.2		-4200.1	
Wald chi2	14.9*		73.9***		208.1***		56.1***	
Censored obs.	182		248		127		127	
Uncensored obs.	326		260		381		381	

Note: Total number of observations is 508. Marginal effects for categorical variables represent the discrete change from the base group. *** $p < .01$, ** $p < .05$, * $p < .1$. (Exchange rate: 53 THB equal 1 GBP on 31st December 2015).

Considering socio-economic and demographic information, INCOME was a significant and positive predictor but less influential when considering the probability of ITT. Higher income level has higher WTP for PNP. AGE was negatively correlated with WTP, which implies that older participants were less interested in PNP. The EMP_{GOV} and EMP_{PRI} negative significant coefficients stress that employees working for public and private organisations are willing to pay higher than self-employed. The coefficients of FEMALE, EDU and BMI are not statistically significant for all models.

As regards impacts of proximal elements on ITT and WTP for PNP, AP provides the largest impact compared with other elements, especially when the probability of intention is taken into account WTP for PNP (see Table 3.3). An increase of 1 unit score of AP increases the probability of ITT and also increases WTP for PNP more than 10% of expected WTP. SN and PT also raises expected WTP for PNP by approximately 5%, while EVS has is the smallest impact on WTP. However, Model 4 shows opposite results in the part of the selection model. Only EVF influences ΔWTP but it has weakly statistical significance ($p < .1$).

Table 3.3 Coefficients and marginal effects of proximal elements of TOT on intention to try PNP

	Model 1: Prediction at time 0		Model 2: Prediction at time 1		Model 3: Average between Time 0 and time1		Model 4: Difference between Time 0 and time1 (T_1-T_0)	
Proximal variables	Z	d(ITT)/dx	Z	d(ITT)/dx	Z	d(ITT)/dx	Z	d(ITT)/dx
EVS	.024***	.008	.045***	.015	.038***	.010	.008	.002
EVF	-.003	-.001	-.005	-.003	.015	.004	-.015*	-.005
AP	.266***	.090	.146*	.051	.278***	.076	.074	.023
PT	.042	.014	.138***	.048	.116*	.031	.010	.003
SN	.202***	.068	.158***	.055	.206**	.056	.039	.012
Constant	-2.54***		-2.75		-3.01***		.730***	

Note: Total number of observations is 508. Marginal effects for categorical variables represent the discrete change from the base group. *** $p < .01$, ** $p < .05$, * $p < .1$.

The prediction of intention probability and expected WTP for PNP is reported in Table 3.4. Focusing on the static models, the simulation results in the first stage show that probability of intention at T_1 reduces to .50, the same as the expected WTP for PNP. When taking ITT probability into account WTP, the means of expected WTP for PNP of ITT group were more than the NITT group at approximately THB 3000. For the ITT group, participants decreased their WTP from T_0 by THB -2459.7, which was more than the amount for the NITT group (THB -1776.8).

Table 3.4 Probability of intention and means of expected WTP for PNP

	Model 1: Prediction at time 0	Model 2: Prediction at time 1	Model 3: Average between Time 0 and time1	Model 4: Difference between Time 0 and time1 (T_1-T_0)
Probability of intention	.640	.508	.774	.743
WTP | ITT>0	8377.2	6626.3	6046.2	-2459.7
WTP | p(ITT)	5409.4	3511.2	4786.3	-1776.8
WTP*	9066.2	8195.5	6426.4	756.7

Note: *Expected WTP for PNP was predicted by linear prediction for ITT group. (Exchange rate: 53 THB equal 1 GBP on 31st December 2015).

3.7 Discussion and implication

The key objective of this study was to model the behavioural stability of purchasing intention taking into account proximal and distal constructs of an extended TOT framework via the Heckman sample selection model. This model was developed and implemented to reduce the selection bias in prediction of behaviour, when the correlation between the error term of the intention function and the error term of the behaviour function was statistically significant. This selection bias supports attitude theories, in which the relationship between attitude and behaviour are mediated by intention (Sutton, 2004; Ajzen and Fishbein, 2005). The outstanding aspect of the Heckman model is the implementation of the selection stage on the behavioural function, which corroborates the findings of Bagozzi and Warshaw (1990). This finding emphasises that the Heckman model is appropriate for exploring other studies that combine expectancy value models with contingent valuation methods.

The empirical results confirm that the influence of attitudes (especially attitude toward process), subjective norms and past trying on intention leading to an influence on behaviour in a positive direction, while attitude toward failure has only an influence on behaviour change but does not influence behaviour. Participants might concern with the failure of trying the service at the follow-up period leading to decrease their WTP for PNP. Among proximal elements, past trying behaviour appear as an essential element influencing intention at the follow-up period, which is consistent with the results of Bagozzi and Warshaw (1990) and Xie *et al*. (2008).

The significant proximal determinants, attitudes toward process and success, subjective norms, and past trying behaviour provide useful insights for marketers and policy

makers to create marketing and social strategies. Marketers may focus on people who have experience trying to achieve a weight goal because their experience might accelerate understanding of how PNP can facilitate the process of weight goal achievement. Moreover, the first stage of the Heckman model also shows not only that participants with intention are willing to pay for PNP, but also that participants with no intention are willing to pay for PNP. Policy makers might promote scientific information concerning personalised nutrition and its benefits via public media to increase positive attitudes toward the process of following a PNP. This strategy might indirectly influence important peers (i.e. family members, friends and partner) by driving and developing intention toward a PNP.

The positive effect of intention stability indicates that intention and behaviour can change over time in both positive and negative directions. This finding is supported by Sutton's (1998) meta-analysis. The gap between intention and behaviour can be represented by stability in intention that also predicts the effectiveness of behaviour (Sheeran, 2002). The empirical results confirm that strong intention have a strongly positive impact on behaviour and behavioural change. Participants who expressed strong intention would perform the effective behaviour and change behaviour in the positive direction. This suggests that this variable should be an essential distal element in the prediction of behaviour.

As regards economic attitudes, results stress that risk aversion has a positive influence on behaviour and time preferences have negative effect on behavioural change. High risk-averse participants were more concerned with body weight so that they were willing to pay for invest in PNP. Time preferences had a negative impact on WTP change because highly impatient participants who could not wait for a larger return were willing to pay less for the healthy product and were likely to reduce their WTP later. The opposite direction between risk aversion and impatience is consistent with the findings of de Oliveira *et al*. (2015) who found that higher risk-averse people are also less impatient, and are also less likely to be overweight or obese. Participants who had these characteristics would like to invest in PNP for achieving their weight goal and reducing health risk (Dardanoni and Wagstaff, 1990; Picone *et al*., 2004). They might be more concerned about weight problems and related diseases of obesity (Anderson and Mellor, 2008; de Oliveira *et al*., 2015). Although this study uses the different measures of risk attitudes from the previous research,the positive impact of

risk aversion elicited by using the SGG-panel lottery on behaviour is consistent with the findings of Anderson and Mellor (2008), which is in contrast with the results of Picone *et al*. (2004) who used four gambling-related questions to elicit risk aversion.

With respect to socio-economic characteristics, age and income level are strong predictors of behaviour. AGE was negatively correlated with WTP, which implies that older participants were less interested and less willing to pay for this service. For income, the positive impact of income level on health-related behaviour is not a surprise because higher-income persons are more concerned with health risks. They can afford PNP to reduce the health risk related to the weight problem. The proposed PNP is a new dietary service that might be more attractive for higher-income people even more than functional foods or drinks. There is a reason to explain why the impact of income from this empirical study is in contrast with Lawless *et al*. (2015) and Bernard and Bernard (2009) where income was consistent with the type of employment. Self-employed people would like to pay more than employees to reduce their future health risks. As self-employed people do not have any public pension system they therefore have to take care of themselves and as a result they may look for a health service for their health and life security. In contrast, government officers had the lowest WTP because their health expenditures are supported by the government. They have access to proper healthcare service and will get retirement benefits from the government pension scheme. These can be reasons why government officers are lacking in motivation for paying PNP.

3.8 Conclusion and future work

To conclude, this study has two predominant contributions. First, the present study presents strongly support the use of the Heckman selection model to explore the impact of proximal and distal constructs when mixing expectancy value models and contingent valuation studies. Our findings suggest that the selection function of HSSM estimation is useful to frame within-individual factors such as proximal elements of TOT influencing intention and behaviour. The outcome function is also useful to consider interesting when analysing between-individual factors such as economic preferences and socio-economic and demographic characteristics as distal components of expectancy value models.

Second, this empirical study contributes to the knowledge of Personalised Nutrition. Our findings provide insights into consumers' attitudes and other proximal elements for policy makers and stakeholders promoting a Personalised Nutrition Programme. Furthermore, findings of distal factors offer insights into consumer's characteristics such as risk attitudes and time preferences, which are beneficial to programme marketers to create an advertisement or financial promotions relying on these characteristics. These may motivate consumers participating in the programme to reduce the overweight and obesity population and related diseases.

This paper did not consider the interaction between variables exploring the impact of proposed elements of TOT on purchasing behaviour and behavioural gap of participants between two periods. Finally, the empirical study elicited only risk aversion, while future research may consider the influence of loss aversion on consumer behaviour. New research avenues could be opened up applying extending these types of conceptual frameworks to other interesting factors explaining consumer and purchasing behaviour.

CHAPTER 4

TIME PREFERENCES AND SENSITIVITY TO PUNISHMENT: THE THREAT OF SATISFACTION AND ACHIEVEMENT ON WEIGHT GOALS

Abstract

This study aims to explore how time preferences and sensitivity to punishment are associated with satisfaction and weight goal achievement. The study also investigates the interaction between satisfaction and achievement in the context of weight control. In addition, this model considers the involvement of goal commitment, resistance to eating temptation in terms of an inhibition facilitator commitment mechanism of weight goal achievement to influence BMI change, satisfaction and achievement. We test all constructs by using exploratory factor analysis and validate the constructs by using confirmatory factor analysis. The final step uses structural equation modelling to validate and identify the path diagram based on the concept of reciprocal causation.

Results show that time preferences are negatively associated with punishment sensitivity and resistance to eating temptation. Impatience has a negative relationship with punishment sensitivity and efficiency of resisting eating behaviour. Sensitivity to punishment directly determines resistance to eating temptation, goal commitment and overall satisfactions. Goal commitment is positively associated with resistance to eating temptation and achievement. Efficient self-control (resistance to eating temptation) determines to change of BMI. Our findings indicate that increasing BMI has a negative effect on overall satisfactions which, in turn, impacts on and threatens weight achievement. Importantly, these results show reciprocal effects between satisfactions and achievements. Satisfaction positively influenced achievements and achievement influenced satisfactions negatively. Goal commitment is an important strategy to improve the efficiency of resistance to eating temptation and achievement. Furthermore, high levels of satisfactions need to be maintained to increase the

possibility of achievement of weight goal, which then goes on to reduces the growth of obesity in the population.

Suggestions for an improvement in the strategy of weight interventions and the satisfaction of individuals that will lead to increased weight goal achievement are fully discussed in the conclusions.

JEL classification: D90, I12
PsycINFO *classification*: 2240, 2360, 3100
Keywords: Time preferences, Sensitivity to punishment, Self-control, Goal commitment, Satisfaction, Goal achievement

4.1 Introduction

It is well known that overweight and obesity lead to an increased risk of several diseases such as high blood pressure, type II diabetic, cardiovascular heart disease, cancer and premature death. This problem has been considered in both low-and-middle-income countries and not high-income countries (WHO, 2016) because being overweight or obese risks not only a person's health but also decreases their quality of life. In social research, health status is an important indicator of happiness and indicate the quality of life (Wilson, 1967; Diener and Suh, 1997; Diener *et al*., 1999). It is well known that obesity is preventable, but the widespread obesity prevalence in the world since 1980 has emphasised the failure of weight control in overweight people, which is challenging for those people who want to achieve losing weight. Most people who are concerned about this try to control their weight through healthy dieting. There are some dieters who succeed in losing weight during weight intervention and then fail to maintain their weight loss or regain weight in three to five years later (McGuire *et al*., 1999; Mann *et al*., 2007). These people cannot maintain their healthy diet and are also not able to change their behaviour after they participated in the weight intervention programme (McGuire *et al*., 1999). This raises the following questions: Why do dieters fail to resist the palatability and availability of food? What are the factors helping dieters to resist eating temptation and to achieve weight control?

In order to answer those questions, the remainder of this paper is organised as follows. Section 4.2 review the psychological components: time preferences, emotional eating, reinforcement sensitivity and satisfaction affecting the body weight. Section 4.3 present

the conceptual framework of this study and the measurements of each construct. Then the data analysis procedure and data collection will be explained in Section 4.4. and Section 4.5, respectively. Section 4.6 reports the results of analysis and the final section will draw the conclusion and future of the study.

4.2 Psychological components affecting body weight: a review

4.2.1 Time preferences, eating behaviours and body weight

Another explanation for the dramatic increase in the world's obesity prevalence is that those who are overweight or obese value the satisfaction of immediate unhealthy food choices more than their concern for a healthy future. This observation highlights the importance of time preferences (TIME) in consumers' preferences and human behaviour. Behavioural economists explain that in everyday life, people trade off consumption between the short run gratification and the long run benefits (Heshmat, 2011). For example, an individual who has high levels of patience are satisfied with waiting to receive a large return by not taking an immediate reward, whereas one who has low levels of patience prefer to take a reward immediately. In the obesity context, it is clear that one makes a decision on food choices relying on two options: 1) enjoyable high-calorie foods and gaining weight later, and 2) trying to consume healthy food and having a good health in the future (ibid.).

Time preferences seem to be irrelevant in the health domain, and it is difficult to elicit the rate of TIME from specific health tasks (Lawless *et al*., 2013). However, it is possible to elicit TIME in monetary terms, which is a more practical way of predicting health behaviour and outcomes such as smoking, drinking and obesity (ibid.). Several health economic studies have shown strong evidence that TIME are significantly associated with health consequences, especially with obesity, at both an individual and national level (Komlos *et al*., 2004; Chabris *et al*., 2008; Zhang and Rashad, 2008; Ikeda *et al*., 2010; Courtemanche *et al*., 2015). For example, the findings of Ikeda *et al*. (2010) confirm the relationship between TIME rate and Body Mass Index (BMI).

Individuals who have higher levels of impatience (a higher TIME rate) prefer enjoyable unhealthy foods and have a higher BMI than individuals who have low impatience. A further explanation of why many people tend to gain weight is that the cost of unhealthy

food is lower than health food in terms of time and money (see chapter 1). Impatient people prefer cheaper foods because they are widely available in the market, easier to consume and contain high calories (e.g. fast foods and processed food) (Komlos *et al*., 2004; Ikeda *et al*., 2010). Nevertheless, several studies regarding TIME found a positive relationship between TIME and weight – the higher the TIME are likely to be higher body weigh (Heshmat, 2006; Leonard *et al*., 2013; Courtemanche *et al*., 2015; de Oliveira *et al*., 2015)t. This suggests that TIME can be a predictor of weight and health behaviours or outcomes. However, so far, no study has explored yet how TIME influence eating behaviours leading to an individual achieving their weight goal.

4.2.2 Emotional eating behaviour

To achieve a weight goal, dieters are required to change lifestyle to sustain their weight loss in the future (Heshmat, 2006). They must change their unhealthy eating behaviours toward healthy eating behaviours. The question is: how can dieters succeed to control themselves, while our bodies crave food all the time like a drug addict? Although food is not addictive in the same way as alcoholic drink or cigarettes, food intake involves the lipid repletion of fat cells and changes body composition and metabolism, which is directly connected with body weight (Brownell *et al*., 1986). Moreover, Berridge (1996) found that eating behaviours are mainly motivated by the food reward, not hungriness. These findings indicate that dieters are not only confronted with physical needs but also the need to control their emotion toward food reward during the weight control period.

Salient rewards from food environment such as convenience, availability, palatability and economical price intensify the temptation of people to overeating (Davis *et al*., 2007). Each individual has a different capability of resistance to survive to these tempting situations. One may have high resistance to temptation while one may not. These actions are reinforced by the function of an independent neurological system, which outlines silent characteristics or human personality (Gray, 1987). It stresses the fact of human nature that people are different, which is explained by personality theories (McCare and Costa, 1990). Several personality research studies on eating behaviour found that personality has a strong influence on food intake and food craving (Franken and Muris, 2005), overeating (Loxton and Dawe, 2001; Torrubia *et al*., 2001; Davis *et al*., 2004a; Davis *et al*., 2007), and it is also correlated with body weight (Davis and Fox, 2008; Sutin and Terracciano, 2015) and obesity (Rydén *et al*., 2003; Sutin *et*

al., 2011; Sutin *et al*., 2013). It is clear that personality is a good factor for exploring the interaction between silent characteristics, eating behaviour and achievement in weight goal. This study focuses on the personality concept of Gray's theory, which will be discussed in the next section.

4.2.3 Reinforcement sensitivity theory in weight control

The reinforcement sensitivity theory proposed by Gray (1981) is widely used to describe the influence of silent characteristics such as self-control and emotional distress on eating behaviour of the individual (Torrubia *et al*., 2001; Davis and Fox, 2008). Two main motivation systems are reinforcing and controlling eating emotion (Gray, 1991): the behavioural approach system (BAS) and the behavioural inhibition system (BIS). People enjoy eating because the BAS controls appetitive approach motivation to eat. BAS is highly correlated with sensitivity to reward (STR) and impulsive personality traits, involved when an individual is pursuing an incentive or reward (Torrubia *et al*., 2001). In the context of obesity, most personality studies capture the influence of STR, which confirms strong positive relationship between overeating and body weight (Davis *et al*., 2004a; Davis *et al*., 2007), and emotional eating such as food craving (Franken and Muris, 2005).

The BIS controls anxiety-based avoidance not to eat (Gray, 1987) and is highly sensitive to punishment (STP) when an individual is threatened by possible failure or punishment (Torrubia *et al*., 2001; Franken and Muris, 2005). According to the literature review conducted by Harrison *et al*. (2010), the cohort of eating disorder patients had a higher STP than healthy patients, but their STR increased when they were starving or were faced with tasty food. When people are happy to be thin and afraid of gaining weight, they are willing to be on a diet and keep weight in control. STP forces people to avoid high-calorie food intake and overeating. This implies that during a diet period, dieters obtain higher scores of STP and anxiety, and also obtain lower scores of STR and impulsivity. In the light of eating disorder research, this study hypothesises that STP can be a key predictor of achievement in weight goal.

In a nutshell, there is less focus on research that investigates the influence of STP on the issue of weight control. If it is possible to understand how a punishment system can influence eating behaviour during a period of weight control, then this will result in a successful diet and should decrease the growth of an overweight and obese population.

4.2.4 Self-efficacy in weight control

Dieting is challenging and requires high levels of self-efficacy, especially in overweight people (Bagozzi *et al*., 2004). Furthermore, Bagozzi *et al*. (2004) found the influence of social pressure that is involved in deciding on diet and eating behaviours as the confluence of autonomous action and individual choice. Self-efficacy is a significant mediating mechanism that helps in understanding how obesity treatment can be coped with effectively, with successful results (Clark *et al*., 1991). According to Bernier and Avard (1986), self-efficacy in expectation of eating behaviours significantly predicts weight change and relates to weight loss. People with high efficacy expectations can resist eating their favourite food or sugary dessert and they are able to survive tempting situations (Brownell *et al*., 1986; Clark *et al*., 1991), while other people with low efficacy expectations might fail to resist eating temptation. Thus, self-efficacy expectations in resistance to eating temptation (RET) may play a mediating role between an internal factor (i.e. personality traits) and achievement of a particular weight goal. Although, various research stutides confirm that personality traits are strongly correlated with goal achievement and satisfaction (Wilson, 1967; Carver and Scheier, 1982; Austin and Vancouver, 1996; Diener *et al*., 1999; Elliot and Thrash, 2002), few studies concentrate on the relationship between goal achievement (ACH) and satisfaction (SAT) in the context of weight goal.

4.2.5 Satisfactions and achievement on weight control

Heinberg *et al*. (2001) proposed a U-shaped curve to explain the association between body image dissatisfaction and dieting behaviours. They claim that healthy behaviours of oversize people are motivated by some level of body image dissatisfaction. For instance, a high level of body dissatisfaction may be helpful motivation to support loss and to promote healthy activities. In contrast, a person with a very low level of body dissatisfaction may fail to be on a diet because of a lack of motivation to engage in weight intervention and control healthy dieting behaviours. Neumark-Sztainer *et al*. (2006) disagreed with the investigation of Heinberg *et al*. (2001) that among adolescents, higher body dissatisfaction does not motivate adolescents to engage in weight intervention. In contrast, they agree that the U-shaped pattern of body image satisfaction exactly explains behaviours of healthy weight control. Consistent with Anderson *et al*. (2002), among overweight and obese women the SAT with body size

is the strongest predictor that a person is likely to attempt to lose weight. Women who are very satisfied with their body size, are nine times less likely to report trying to lose weight than women who are not satisfied. This implies that SAT with body shape may predict the outcome of ACH. This study hypothesises that an individual who is not satisfied with his/her body shape or weight may have high motivation to control their weight and try to achieve their weight goal. The positive performance will be pleasing and will therefore increase the overall SAT. On the other hand, a person who highly appreciates their body shape or weight may have less motivation to control their weight. The negative performance may be displeasing and may decrease their overall SAT level.

SAT with body shape has been the focus of some obesity studies. For example, Sonneville *et al*. (2012) stress that SAT with body shape is a good predictor of BMI change among adolescences aged 9 to 14 year for 5 years, while Anderson *et al*. (2002) focus on women aged 40 years and over, proposed that SAT with body shape is a strong predictor of trying to lose weight. This study proposes that change in weight may influence SAT from several domains not only SAT with body image when weight goal was set and intend to control the weight. Because weight not only links to body image perception but also is strongly associated with health (Heshmat, 2006; Anderson and Mellor, 2008) and diet (Davis and Woodside, 2002; Davis *et al*., 2004a; Davis *et al*., 2007; Heshmat, 2011). It is well known that overweight and obese status have high risks of related diseases such as type 2 diabetes, hypertension and metabolic syndrome. Moreover, the dieting control is a significant strategy to control the weight and treat the disease. Furthermore, life satisfaction should be involved in the evaluation of overall SAT as well. Because life satisfaction is an important indicator indicating subjective well-being or happiness of the individual (Wilson, 1967; Diener *et al*., 1999). Thus, SAT in this study will be investigated based on four dimensions: body shape, health, diet and life satisfaction.

Consistent with the above discussion about the influence of SAT on ACH, there is another piece of evidence suggesting that ACH has a possible influence on SAT. An individual may have various goals and easily set a goal, but it may not be easy to follow and achieve that goal if it is difficult. It means that achieving a goal potentially makes a good feeling or an increase in SAT (Emmons, 1996). The findings of Brunstein (1993) emphasise that the achievement of personal goals related to study, family, jobs and

health lead to a change in the subjective well-being or SAT of the individual. Later on, Sheldon and Elliot (1999) suggest that psychologists should consider SAT as a factor of psychological needs to mediate the relationship between ACH and well-being of the individual. They claim that SAT of psychological needs indicates competence, autonomy and relatedness based on the self-determination theory (Deci and Ryan, 2000; Ryan and Deci, 2000). For example, some individuals may not take it seriously when people commit to a goal. This study selects SAT to represent these aspects because the satisfaction facilitates the gap between goals and desired outcomes (Sheldon and Elliot, 1999).

4.2.6 Weight goal commitment

According to the goal-performance relationship, goal commitment (GC) is a significant construct to interpret the association between goals and task performance (Klein *et al*., 1999). When an individual accepts and specifies a weight goal, it implies that he or she will commit and try to achieve it, (Locke *et al*., 1968; Locke *et al*., 1981). However, he or she might stop trying control their weight as he or she perceives it to be a difficult task (Locke *et al*., 1968). Brunstein (1993) recommended that the GC should be in a part of progress of goal achievement because high commitment stated the value of the goal, which then reduces the probability of failure and facilitates achievement. Klein *et al*. (1999) also emphasised that goal commitment is a significant component of goal-setting theory because it will ensure success when a person commits to difficult goals. Similarly, as can be seen in the investigation into weight intervention by Wing and Hill (2001), participants who maintained successful weight loss for five years were highly committed to weight control. Their commitments affirmed a willingness to invest effort and take responsibility for diet and exercise. Their finding was not consistent with the meta-analysis of Klein *et al*. (1999) which showed that the GC might not be able to predict the result if the apparent attractiveness was low. Sheldon *et al*. (2003) argued that it is not only attractiveness and value but also personal feeling which influence the GC. They explained that individuals who were satisfied and who freely selected a goal were more highly committed and felt more volition towards their goal than individuals who were forced by external pressure. This argument indicates a possible linkage between GC, achievement and satisfaction. According to Brunstein (1993), GC was a moderator of the relationship between goal achievement and students' subjective well-being using a satisfaction with life scale. This study combines their results and applies

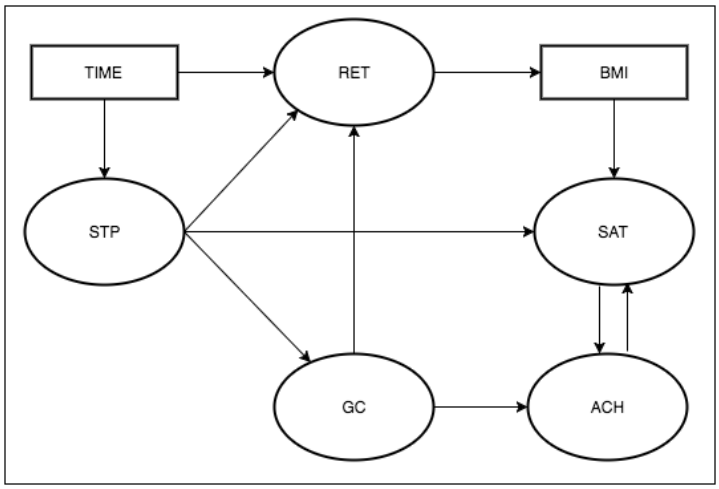
them in the context of a weight goal, which hypothesises that satisfied commitment to weight goal may positively influence satisfactions when the goal was achieved. Although Klein *et al*. (1999) also stated that high GC might be dysfunctional and detrimental to some people because of stress, anxiety, or health risks, this study still believes that GC may be an important role of ACH.

4.3 Methodology

4.3.1 Conceptual framework

To sum up, it is worth investigating the psychological components of weight control as these elements may improve the strategy of weight interventions and satisfaction of individuals. Figure 4.1 shows the conceptual framework of this study presents in where the proposed path diagram indicates that an inhibition facilitator commitment mechanism of participants' goal achievement is explored.

The path diagram shows that TIME and RET can be thought as distal variables because they influence directly the relationship between SAT and ACH. On the other hand, STP, BMI and GC can be identified as proximal elements because they affect directly the bi-univocal relationship between SAT and ACH which as the core of the proposed conceptual framework.



Note: TIME= Time Preferences; RET=Resistance to Eating Temptation; BMI=Body Mass Index; STP=Sensitivity to Punishment; GC=Goal Commitment; SAT=Satisfactions; ACH=Weight Goal Achievement

Figure 4.1 The path diagram of hypothesised relationships among time preferences, STP, RET, goal commitment, satisfaction and weight goal achievement

TIME represent levels of individual impatience when people are waiting for a greater reward. This factor may influence the decision making on weight goals, eating behaviours and STP. It is hypothesised that TIME have negative effects on STP and RET, which represents self-efficacy on eating behaviour. STP is positively associated with RET. The STP will denote the personal response under undesirable situations, which assumes a negative association with GC and SAT. We believe that when the goal was set, STP may be a key predictor of ACH. In this model, self-control and goal commitments represent the inhibition process that individuals face when they want to give up their stated goal achievements.

The output of this model focuses on how distal and proximal elements influence BMI changes, life satisfaction and weight goal achievement. Considering the causation of GC to the goal, we hypothesise that commitment to weight goal has a positive effect on RET and ACH. RET is assumed to directly impact on the change of weight represented by BMI, and their relationships will be negative. Furthermore, the model will stress the influence of weight change on SAT, which will be considered from by four viewpoints: life, health, diet and body shape. This study hypothesises that BMI change is negatively correlated with the SAT. Finally, this path diagram proposes the reciprocal causation between the SAT and the ACH on weight goal. A further hypothesis is that the SAT has negatively affected the ACH, and the ACH has positively affected the SAT.

4.3.2 Measurements of distal and proximal elements

1) Distal elements

Time Preferences. To measure the patient overtime, participants were asked to select their choice between collecting THB10,000 immediately or waiting for a larger amount in one year later under 10 options. The first option added 10% of the initial money (THB11,000), and the next option would be increased every 10% up to 100% (THB20,000). The first switching point from the immediate amount to the delayed amount would be used to represent the degree of patience of the participants waiting for the preferred return in the next year.

Resistance to eating temptation (RET). RET was measured with 14-item self-assessment based on Bagozzi *et al*. (2004). Participants were asked to rate the eating resistance of undesirable foods with 14 four-point statements from strongly disagree to strongly agree. Bagozzi and his colleagues selected 11 statements from Clark *et al*.

(1991) to represent eating resistance under four broad situations, The first situation considered the influence of social pressure to eat at the moment (I can resist eating 'even when I have to say "no" to others', 'even when others are pressuring me to eat', and 'even when I feel it's impolite to refuse a second helping'). The second situation represented certain negative emotion (I can resist eating 'when I am depressed', and 'when I have experienced failure'). The third situation was food availability under specific conditions (I can resist eating 'when there are many different kinds of food available', 'even when high-calorie foods are available (my favourite foods)', and 'when I am at a party'). The final situation was a positive activity in daily life (I can resist eating 'when I am happy', 'just before going to bed', and 'when I am reading'). Further, three items were added to cover normal life experiences: I can resist 'at buffet (all you can eat) restaurants', 'when I go out shopping', and 'more than usual around holiday'. To confirm the reliability of RET scale, the internal consistency was tested and found that the alpha coefficient for all items was .843.

2) Proximal elements

Sensitivity to punishment (STP). STP was assessed by the 24-item self-reported measure of Torrubia *et al*. (2001). This scale was used to assess the participant's responses under several situations of failure or punishment. For example, 'Are you afraid of new or unexpected situation?' or 'Would it be difficult for you to ask your boss for a raise (salary increase)?' The reliability of STP scale in this study was .702, which has provided acceptable internal consistency.

Satisfaction (SAT). Overall SAT was evaluated in four domains, i.e. life, diet, health and body shape as the following questions: 'Overall, how satisfied are you with your life?', 'Overall, how satisfied are you with your diet?', 'Overall, how satisfied are you with your health?', and 'Overall, how satisfied are you with your body shape?'. Respondents were required to assess their SAT by rating score from 1 – 10 (totally dissatisfied to totally satisfied). The Cronbach's alpha for these items is .826, which confirmed that SAT scale had high internal consistency.

Goal setting and Goal commitment (GC). As regards goal setting, participants set the weight goal in the first survey. The question of the goal setting was 'Thinking of your eating habits, what goal would you like to try to achieve in the next six months?', and it followed three options: to stay about the same weight, to lose weight and to gain

weight. Participants are also required to specify the goal and desirable weight change (kilogram units) when considering their current weight. Based on our analytic sample size in this study, the goal of the majority of participants (70.87%) was to lose weight, 19.01% was to stay the same weight, and only 10.03% was to gain weight.

With regard to goal commitment, weight commitment was assessed by nine unidimensional items related to performance and antecedent results of achievement (Hollenbeck *et al*., 1989). Each statement was elicited via a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. Although Klein *et al*. (2001) suggested the revision version (five out of nine items), which produced better fit statistics, this study will use the original nine-item version of Hollenbeck *et al*. (1989) (Table 4.1) as this construct has never been tested with Thai samples. The reliability of this construct was .627.

Table 4.1 Hollenbeck *et al*. (1989)'s goal commitment items

No.	Statements
1.	It's hard to take this goal seriously. (R)
2.	It's unrealistic for me to expect to reach this goal. (R)
3.	It is quite likely that this goal may need to be revised, depending on how things go. (R)
4.	Quite frankly, I don't care if I achieve this goal or not. (R)
5.	I am strongly committed to pursuing this goal.
6.	It wouldn't take much to make me abandon this goal. (R)
7	I think this is a good goal to shoot for.
8.	I am willing to put forth a great deal of effort beyond what I'd normally do to achieve this goal.
9.	There is not much to be gained by trying to achieve this goal.

Note: Statements followed by (R) was converse-scored before analysis.

4.3.3 Measurements of weight control's outcome

Body mass index (BMI). BMI was measured asking participants to state their height and weight in the first and second survey. BMI was calculated by body weight in kilogram dividing by the square of body height in meters square (kg/m^2) referred to the second survey. Surprisingly the final average BMI of 508 participants was 23.6 (SD=4.8) as similar as the initial BMI, but overall participants seem to gain weight after six months. From the baseline, 39.9% of participants was normal weight, 31.5% was

overweight, and 18.1% was obese. At the follow-up period, the percentage of normal weight group decreases to 40.0%, underweight, overweight and obesity group increase to10.4% 31.5% and 18.1% respectively. The BMI change ranges from -11.05 to 8.43 (MEAN=.06; SD=1.8).

Weight goal achievement (ACH). The ACH was assessed developing four conditions measured with four items (ACH1 to ACH4)

The ACH1 was evaluated by soft condition calculated by different criteria showed in Table 4.2. Participants were classified into the achieved group (ACH1=1) in two ways. Firstly, participants have good performance in weight change depending on their goals, or secondly, they can maintain their original weight (BMI_C=0). For example, a participant, who intended to lose weight, was identified as achieving the goal (ACH1=1), when his or her weight was equal to or lower than their original weight (BMI_C $\leq$ 0). A participant, who intended to gain weight, was identified as not achieving the goal (ACH1=0), when her weight was lower than their initial weight (BMI_C < 0). This study considers the weight in the first survey to be a reference point. It is the baseline for acceptable performance because weight control is a difficult task. Some participants may change their goal later or likely decline their efforts may decline when their weight has gone to an immediate goal (Kahneman, 2011). This is a reason why participants who could maintain their initial weight were assigned to the achievement group.

Table 4.2 The criteria for weight goal achievement of the first condition

Goals	ACH1=0	ACH1=1
Losing weight (n=360)	BMI_C > 0 (n=159)	BMI_C $\leq$ 0 (n=201)
Staying the same weight (n=97)	BMI_C $\neq$ 0 (n=69)	BMI_C = 0 (n=28)
Gaining weight (n=51)	BMI_C < 0 (n=11)	BMI_C $\geq$ 0 (n=40)
Total (n=508)	239	269

Next, ACH2 was evaluated using the same way as ACH1 involving the weight status when the goal setting was staying the same weight. If BMI_C was negative and initial BMI status is overweight or obesity, ACH2 is classified into an achieved group. If BMI_C was positive and initial BMI status is underweight, this case is in the achieved group as well. The failure condition is the positive BMI_C, and final BMI status are normal weight, overweight and obesity, and the negative BMI_C with the final BMI

status is underweight and normal weight. Overall assessment of this condition is demonstrated in Table 4.3.

Table 4.3 The criteria for weight goal achievement following the second condition

Goals	ACH2=0	ACH2=1
Losing weight (n=360)	159	201
Staying the same weight (n=97)	52	45
Gaining weight (n=51)	11	40
Total (n=508)	222	286

The ACH3 assesses under hard conditions comparing the different magnitude between weight goal change and real weight change (ΔW). Participants were categorised into the achieved group (ACH3=1) when $\Delta W \leq 0$, and they were categorised into the failure group when $\Delta W > 0$. The result of this condition is presented in Table 4.4, which indicates that the members of achieved group between two soft conditions and the hard condition are totally different.

Table 4.4 The criteria for weight goal achievement following the hard condition

Goals	ACH3=0	ACH3=1
Losing weight (n=360)	346	14
Staying the same weight (n=97)	69	28
Gaining weight (n=51)	39	12
Total (n=508)	454	54

The ACH4 considers the ACH involving progress. ACH4 is divided into five groups: 1=failed and getting worse, 2=failed without progress, 3=failed and having progress, 4=success and 5=success with good progress. The first group (ACH4=1) is marked when participants not only fail the goal but also get worse compared with their goal setting. ACH4=1 has three conditions, 1) weight increases in case of losing weight goal, 2) weight increases weight in case of maintaining weight goal, and 3) weight decreases in case of gaining weight goal. The criteria of ACH4=2 has considered that participants fail but can maintain their initial weight for losing and gaining weight goal. The conditions of ACH4=3 are denoted when participants fail to achieve the weight goal but have made some positive progress. This can be seen when, for example, one person sets out to lose 10 kg but they lose only 5 kg. or someone may intend to gain 5 kg but they gain only 1 kg. A further condition is when participants have lost weight while

their goal was to maintain weight. These cases are considered as a failure of progress. The ACH4 is denoted at 4 when ΔW is zero, and ACH4 is denoted at 5 when ΔW is negative. The number of samples for each category is shown in Table 4.5. The information shows that only 3.5% of participants who tried to lose weight can succeed the goal. Moreover, 40% of this group has gained weight within six months. It is not surprising that the growth of the obesity population has increased dramatically.

All ACH types will be observed variables for the construct of ACH in the main analysis of this study. The reliability of ACH construct is .788 and .829 for Cronbach's alpha based on standardised items.

Table 4.5 The criteria for weight goal achievement following the progress condition

Goals	ACH4=1	ACH4=2	ACH4=3	ACH4=4	ACH4=5
Losing weight (n=360)	145	63	138	14	0
Staying the same weight (n=97)	33	0	36	28	0
Gaining weight (n=51)	11	11	17	6	6
Total (n=508)	189	110	155	48	6

4.3.4 Data analysis procedures

Three-step modelling will be applied for testing the hypothesised model. In the first step, five constructs containing 55 items will be summarised by Exploratory Factor Analysis (EFA) using IBM SPSS, version 22. EFA results show the performance of each item belonging to a particular factor structure for each scale (Bowen and Guo, 2011). The factor structure is specified at five factors by Principle Component extraction method and rotated by Promax procedure because we assume that factors are correlated. Items will be selected when their loading is more than .3 to increase reliability and internal consistency of each scale (Hair, 2014). For the next step, to confirm the factor structure of the revised instrument supporting the data for this study, the structural model was tested the quality of existing items by using Confirmatory Factor Analysis (CFA). CFA will test measurement models and be analysed by AMOS version 21.0. The CFA model is estimated using ML procedure. Then all latent variables will be estimated by using regression imputation to reduce the complexity and the detail of the proposed model. As the hypothesised model has a direct feedback loop

(ACH ⇆ SAT), the final step, all variables showing in the path diagram (Figure 4.1) will be estimated using Structural Equation Modelling (SEM) and ML estimation (Kline, 2011).

To assess the model fit, goodness-of-fit (GOF) of models was evaluated by five indices including Chi-square (χ^2), relative chi-square, two absolute fit indexes: Goodness of Fit Index (GFI) and Root Mean Square Error of Approximation (RMSEA), one incremental fit index: Comparative Fit Index (CFI) (Hair, 2014). GFI is a fit guideline showing how the residual continues after model fitting significance. RMSEA indicates the performance of the proposed model that fits the population not only the sample. CFI compares the target model with the null model. Hair (2014) recommended the GOF when the number of samples is more than 250 and observed variables are less than 12 that the p-value of χ^2 shows insignificance; GFI and CFI are greater than .95; the acceptable value of RMSEA should be less than 0.7 with CFI being equal or more than .92. Byrne (2013) suggested χ^2/df value in the range of 3 to 1 and RMSEA is less than .05.

4.4 Data collection and Participants

This study targeted adults who work in Bangkok and are concerned about their weight. Participants were recruited by advertising in local shops, and social media and they were invited to face-to-face interviews at the office of Centre for Applied Economics Research, Kasetsart University and were offered an incentive (THB300). Five hundred and ninety-seven volunteers participated in the first survey and were required to fill the answers the self-assessment of sensitivity to punishment questionnaire and personal information including weight and height. They were also asked to set their weight goal (losing weight, staying the same and gaining weight) and to specify the weight desire for the next six months. The questionnaire of the second survey has five parts: weight information, goal commitment (GC) assessment, satisfaction (SAT), time preferences (TIME), resistance to eating temptation (RET). The questionnaire was translated into Thai and evaluated via three pilot studies. The first two pilots aimed to test language balance via seven volunteers who can communicate both in Thai and English. The third pilot tested the revised version by twenty-eight volunteers. This research has been reviewed according to the procedures specified by the University Research Ethics Committee of University of Reading.

89 participants (14.9%) of the original participant (n=597) were absented to follow up for three reasons, not willing to participate the research for the second survey (n=63), moving workplace to other provinces (n=5), no contract information at follow-up (n=21). Finally, 508 participants (60.63% female, range 18-74 years) were willing to participate in the second survey. The average initial BMI of the final participants was 23.6 (SD=4.9). According to the criteria of Asian weight status (WHO expert consultation, 2004), a 43.4% of all participants was normal weight (BMI ≥18.5 and ≤ 23.0); 30.0% was overweight (BMI >23.0 and ≤27.5); 16.7% was obese (BMI > 27.5), and 9.6% was underweight (BMI<18.5).

4.5 Results

4.5.1 Identifying items for existing scales

The result of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity obtained performing exploratory factor analysis indicate the suitability of the selected modelling approach (KMO=.744; Bartlett's test: Approx. χ^2 =8243.7, d.f.=1485, $p < .001$). Five factors having eigenvalues ranging from 2.2 to 5.5 explained 31.4% of the total variance. Clearly, 43 high-loading items belong to the original constructs (TIME, STP, RET, GC, SAT and ACH) without cross-loading. The first factor contains all RET items and the degree of correspondence between these items and the RET construct factor ranged from .372 to .682. The second factor contains 13 items which identify the STP latent dimension with factor loadings ranging from .356 to .618. The third factor contains eight items representing the goal commitment construct with factor loadings ranging from .317 to .762. The fourth factor represents the satisfaction construct. with factor loadings ranging from .716 to .822. The fifth factor identifies the goal achievement construct with factor loadings ranging from .447 to .909. The last two constructs showed higher factor loading than the first three constructs. The component correlation among factors ranges from -.149 to .131. All existing items for the STP and GC constructs were tested via internal consistency again. The alpha coefficient of the revised STP scale was .740 (higher than the full version), while that of the revised GC scale was 0.606 (lower than the full version).

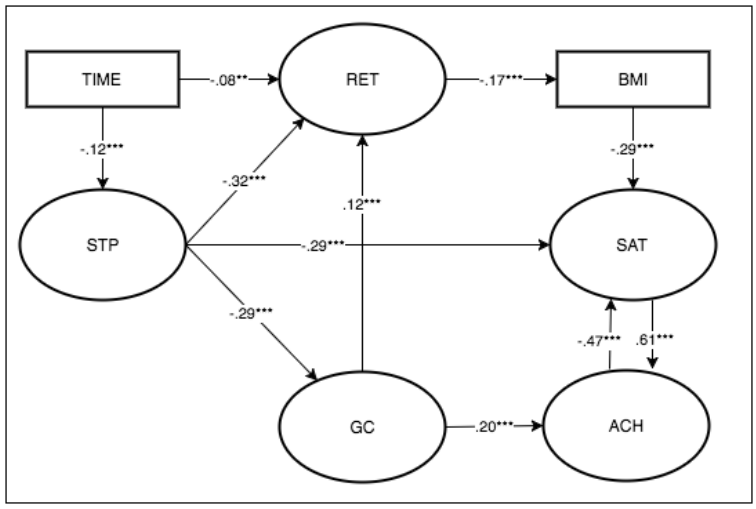
4.5.2 Validity of existing scales and measurement model

The value of skewness and kurtosis range from -2.1 to 2.5 and -1.9 to 4.5 respectively. Although these values are confusing, these indicators have impacted on different tests. Skewness influences the test of means and kurtosis seriously influences the test of variances and covariance. According to the CFA and SEM results based on covariance structures, the kurtosis should mainly be considered for a normality test (Byrne, 2013). Although the kurtosis value is out of the desirable range and indicates moderate nonnormal distribution, the model should be still estimated by ML procedure (Olsson *et al*., 2000).

The first output of the measurement model is very poor for all reported fit measures. Overall $\chi^2$is 3373.0 with 856 for df and the probability level of χ^2 <.001; χ^2/df = 3.940; GFI=.791; CFI=.637 and RMSEA =.076. To improve the model, some items are allowed to be correlated in the model based on some suggestion of modification indices (Byrne, 2013). In the final model, the overall chi-square value decreases to 1991 and degree of freedom decreases to 827 leading to decreases χ^2/df ratio from 3.940 to 2.408. Other indices also provide acceptable fits: GFI=.878; CFI=.829 and RMSEA=.053.

4.5.3 Test of a structural model

The univariate skewness and kurtosis values of the seven variables in the path diagram (Figure 4.1) range from -.7 to 1.2 and -1.9 to 2.8 respectively. Although the kurtosis of an individual variable indicates moderate nonnormal distribution, the C.R. value of multivariate (-.5.89) indicates the normal distribution of all variables in the sample (Byrne, 2013). The proposed model shows a good model fit for all criteria. The overall chi-square of the model is significant (18.011; df=10; p>.05) and the relative chi-square is 1.801, which confirms that the hypothesised model is a very good fit model. The RMSEA value is .040 expressing a well-fitting model for a population not only a sample (Hu and Bentler, 1999). The GFI value is .990 denoted that the proposed model is well to reproduce the observed covariance matrix approximately 99.0%. CFI is .968 confirming that the hypothesised model is better than the null model. The stability index (.284) is within the desirable range of 0 to 1, which confirms the stability of nonrecursive model or the reciprocal relation between ACH to SAT. The standardised regression weights or total effects for each path in the model are shown in Figure 4.2.



Note: * A path is significant at the .1 level; ** A path is significant at the .05 level; ***A path is significant at the .01 level

Figure 4.2 The revised path diagram with standardised regression weights for all significant statistical relationships.

4.5.4 The effects of preferences, personality and self-control on weight achievement

According to direct, indirect and total effects, the standardised coefficient of direct paths shows that TIME has negative and moderate effects on STP (β=-.12; p<.01) and slightly effect on RET (β=-.08; p<.05). This negative association implies that impatient people have lower STP and tend to eat more than patient people when they have negative emotions such as anxiety and unhappiness. All standardised coefficients of direct effects of STP on RET, GC, and SAT are strongly negative (p<.01). These indicate that people who are more STP tend to decrease their RET and increase their eating when feel uncertain or sadness. Likewise, more concern about punishment leads to a decrease in the degree of GC to the goal and overall satisfactions.

The relationship between RET and BMI is strongly negative (p<.01). High capacity of RET tends to decrease weight. BMI has a negative association with SAT. It suggests that an increase in BMI accumulates dissatisfactions in term of life, diet, health and body shape. Furthermore, the effect of GC on ACH demonstrates significantly positive and more power than the effect on RET. The potential success in weight goal has been increased when dieters have strongly committed to weight goal. Interestingly, the result emphasises strongly reciprocal effects between ACH and SAT but opposite direction

of the hypothesis. SAT have a strongly positive impact on ACH (β=.61; p<.01), and the ACH has negative impact on SAT (β=-.47; p<.01). Moreover, the direct effects between them are very high compared to other direct paths. High SAT leads to succeed the weight goal than low SAT. Unfortunately, success in weight goal tends to reduce the SAT.

Standardised coefficients for indirect effects of the model (see Tables 4.6-4.8), TIME is positively indirect effects on RET meditated by STP, which is smaller than a direct path in the negative correlation. It means that the sign of this total effect of TIME on RET is negative. It implies that impatient people are less effective of RET. For example, impatient people have lower potential to resist to temptation of eating desserts than patient people because they are happy to consume desserts. STP is the most powerful predictor of RET and indirectly influence BMI positively. This implies that high impatient people tend to have higher BMI than patient people. Fortunately, this effect is smaller than the direct effect of RET on BMI, which has a negative sign. Moreover, STP and BMI have indirect effects on ACH. STP gives the highest indirect effect in a negative direction on ACH (-.191), while BMI is lower (-.138). Punishment sensitivity goes up by 1 standard deviation (SD), ACH goes down by .191 SD. In other words, when one feels sad, he or she is low capable of achieving a weight goal. Likewise, the effect of BMI, when BMI goes up by 1 SD, ACH goes down by .138 SD. It implies that oversize people are less likely to succeed in weight goal than slim people.

Table 4.6 Standardised direct effects of all variables in the model

	TIME	STP	GC	RET	BMI	ACH	SAT
STP	-.120						
GC		-.287					
RET	-.081	-.319	.121				
BMI				-.168			
ACH			.197				.609
SAT		-.292			-.290	-.466	

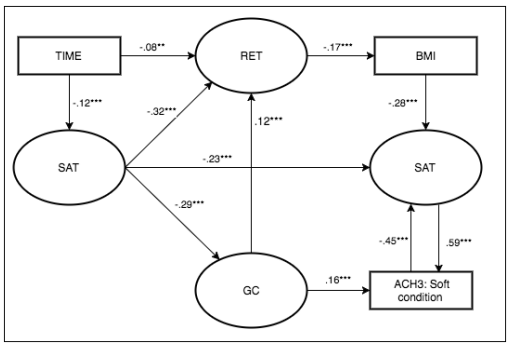
Table 4.7 Standardised indirect effects of all variables in the model

	TIME	STP	GC	RET	BMI	ACH	SAT
STP							
GC	.035						
RET	.043	-.035					
BMI	.007	.060	-.020				
ACH	.021	-.191	-.041	.023	-.138	-.221	-.135
SAT	.023	.072	-.067	.038	.064	.103	-.221

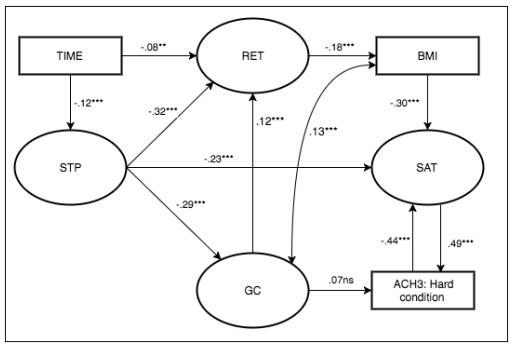
Table 4.8 Standardised total effects of all variables in the model

	TIME	STP	GC	RET	BMI	ACH	SAT
STP	-.120						
GC	.035	-.287					
RET	-.039	-.354	.121				
BMI	.007	.060	-.020	-.168			
ACH	.021	-.191	.156	.023	-.138	-.221	.474
SAT	.023	-.220	-.067	.038	-.226	-.363	-.221

Moreover, the revised model is also estimated by different evaluations to investigate how parameters change in the prediction of ACH. The soft condition of ACH involving the BMI status is selected to compare with a hard condition of AHC. The result of scenario 1 (soft condition) is the same direction as the main model, but the result of scenario 2 is slightly different. The relationship between GC and ACH based on a hard condition is insignificant (p>.1), while other relations is similar to the main model as same as a result in situation1.



Scenario 1: Soft condition (ACH2)



Scenario 2: Hard condition (ACH3)

Figure 4.3 Standardised regression weights between two different evaluations of weight achievement

4.5.5 Discussion and Implications

The interaction between proposed components in the context of weight goals and ACH is confirmed. Many relationships follow stated hypotheses except for the STP→RET, ACH→ SAT and SAT→ACH relationships. Their coefficient signs are in the opposite direction of s stated hypotheses, but still strongly statistical significant.

TIME has a negative association with STP and RET. The magnitudes of coefficients emphasised that TIME is the primary predictor of STP. Impatient individuals who preferred immediate reward or happiness tend to be lower in STP than patient individuals. Remarkably, STP has a strong negative impact on GC, RET and SAT. People high in STP are less committed to weight goal compared with individuals low in STP. High STP people might be more anxious about this goal difficulty and how hard it could be to achieve it. They might be not willing to commit to the goal or to decline the GC degree. The self-control of eating behaviours might decline. The negative relationship between STP and RET is consistent with the report of Slessareva and Muraven (2004), which found a vulnerability to emotional distress mediating this relationship. Unsurprisingly about STP→SAT association, weight goal seems difficult to individuals leading to decrease their satisfaction.

RET is determined by three factors: TIME, STP and GC. GC is only one predictor having a positive relationship with RET. It stresses the importance of GC on weight goals; this determinant could increase the efficiency of RET leading to decrease BMI of oversize people. Our result suggests that RET is the most significant predictor of BMI. The high efficiency of self-control on eating behaviours is related to decreasing BMI. On the other hand, low efficiency of self-control would increase BMI.

Moreover, other predictors indirectly predict the BMI. These findings point out that TIME is positively associated with BMI through RET involved with STP, and the effect of TIME on BMI is very small. In contrast, several past studies found a strong and positive correlation between TIME and BMI at the individual level (Chabris *et al*., 2008) and national level (Komlos *et al*., 2004; Ikeda *et al*., 2010; Courtemanche *et al*., 2015). However, the sign of the relationship between them is positive and stresses that in the short run an impatient person selects enjoyable life and diet which will lead her to increase weight and health risks. Likewise, the investigation of Davis *et al*. (2004a), high sensitivity to reward derived pleasure from food like a drug addict, which risks

overeating and being overweight. The positive effect of STP on BMI in this study confirms the finding of Davis *et al*. (2004a). High STP has a positive association with emotional overeating (low capable of RET) leading to an increased BMI when people are in a depressed mood or suffering from other negative emotions.

BMI is associated with SAT in the negative direction and this is consistent with the past reports (Pingitore *et al*., 1997; Anderson *et al*., 2002). Though Pingitore *et al*. (1997) conducted a study among college undergraduates, the same direction of results emphasises that both adolescents and adults are sensitive to weight and body shape. Moreover, BMI is a good predictor of satisfaction and could be applied across cultures. The result of this study regarding the BMI and SAT relationship not only confirms the findings of previous research but also extends the BMI influence on other satisfaction domains such as life, health and diet, and not just body shape.

The results of the model emphasise that SAT is the most critical predictor of ACH in weight goal. Moreover, the reflection of success in weight goal tends to decrease the SAT. Both direct paths conflicted with the hypothesis of these reciprocal effects. SAT has a positive association with ACH, and ACH has a negative association with SAT. The reciprocal effects between ACH and SAT enhance the findings of Anderson *et al*. (2002) concerning the connection between SAT with body shape and trying to lose weight. Both Anderson *et al*. (2002) and Heinberg *et al*. (2001) agree that trying to achieve weight loss is motivated by low SAT with body shape. However, Anderson *et al*. (2002) found that trying to achieve that goal seems to decrease SAT as well. According to Hoch and Loewenstein (1991), the change of reference point can decrease SAT because of adaptation shift. This decrease can imply that when dieters try to achieve the weight goal but cannot achieve it, SAT will decline because their trying has been relieved. The delayed reward is larger than an immediate reward for health benefits while the impatient persons could change their mind over time while waiting. While trying to achieve the goal, dieters might be stuck with their GC and resist temptation (i.e. dessert, soft drink or high caloric food). Although highly effective RET leads to weight loss, dieters desire to achieve their goal as soon as possible. As a result, SAT might decline because of following the healthy diet plan and being far away from a favourite food or high caloric foods. Moreover, STP might extend as a negative emotion during weight intervention, and this has a detrimental effect on SAT. Another possible reason is that dieters desire the ideal weight and would like to achieve it

without being practical. Furthermore, the weight goals might be set as too low compared with their real weight desire. For example, someone may set out to lose weight by 1 kg within six months, while, in fact, they would like to lose 10 kg. This easy goal has potential achievement within one month, but they are still dissatisfied with their weight. Another reason is a social comparison. Hoch and Loewenstein (1991) argue that some people may favour to compare themselves to others, which may lead to decrease SAT owing to goal achieved.

These findings demonstrate that GC and SAT have direct positive effects on weight ACH. It brings an advantage to both dieters, managers of weight intervention and health policy. This study suggests that GC process and SAT assessment are required during the participation to increase the degree of ACH. Though GC does not affect the ACH when considering the hard condition, it is a strong determinant for ACH under soft condition. As this study invited participants setting their weight goal for six months without any intervention. A half of participants could reach the goal under the soft condition, while a 10.6% of participants accomplished it under hard condition. The output of the hard condition model shows a lack of successful weight goal. It means that GC under the difficult condition is dysfunctional, which is consistent with the finding of Klein *et al*. (1999). This comparison indicates that GC is an excellent activator making progress towards success outcomes in a general situation, likewise the recommendation of Brunstein (1993). Our results suggest that GC is the key to address obesity problems because a high GC can increase the level of self-control on eating behaviours leading to a decreased BMI. This is similar to the suggestion of Zhang and Rashad (2008).

To maintain SAT, dieters should be aware of negative emotions in order to prevent an increase in STP and they should focus on delayed reward from a healthy diet rather than from immediate enjoyment. Moreover, dieters should compare their progress with the starting point only, and should not compare it to others', possibly superior, progress. A weight intervention team should be involved with a psychologist to monitor and improve emotions and satisfaction of participants. Policy makers may create incentive strategies to improve the positive feeling and should be aware of the causes of decreasing SAT while promoting healthy schemes such as eating behaviours and physical activity.

4.6 Conclusion and future work

This article attempts to explore how TIME and STP influence SAT and ACH in weight goals. The study proposes a model to explain the mutual relationship between SAT and ACH involving TIME, STP, GC, RET and BMI. This model is drawn on the basis of behavioural economics and psychological research related to obesity problems. In our model TIME was measured in monetary terms to be a proxy for an individual's impatience waiting for a more substantial delayed reward such as health benefits from weight control. The STP expresses the personal response under awkward situations that are vulnerable to negative emotions such as unhappiness, panic, anxiety and frustration. These findings highlighted that impatience, and individual differences evolve into the ability of self-control of eating behaviours leading to altered body weight. The model also bears on the influence of the satisfaction-achievement relationship showing a reciprocal causation in the context of weight goal. The feedback loop between satisfaction and achievement help explain a cause of weight loss failure in the long term. The results suggest that goal commitment is a crucial predictor to develop strategies for addressing obesity problems.

A weakness of this study was using subjective, self-reported weight and height that might be inaccurate. However, people may probably lie about their weight as well. The desired weight could be set as a weight goal, and we did not consider the reality of that goal. Moreover, the outcomes of weight achievement were assessed by researchers without self-assessment. Future work should directly measure weight and height, and ask participants to assess their performance.

CHAPTER 5

CONCLUSION AND FUTURE WORK

This chapter summarises all the research conducted in Chapters 2, 3 and 4. The reader will get the summary of this thesis, including a consideration of the studies' contributions and future research. The contributions of this thesis will be discussed explicitly in two dimensions, i.e. academic contribution and practical contribution. The limitations of this research will be discussed and linked to future research.

5.1 Research summary

5.1.1 Problem definition

In the first chapter, the research background concerning the recent obesity situation of the world and especially in Thailand was presented. Then, the economic and social psychological causes of obesity were discussed in order to brief the reader and to provide an understanding of the selected predictors of the analysis. From the literature review, it is clear that there are several internal and external factors which can lead to obesity and which can be threaten an individual's achievement of weight loss goal. At the individual level, changing behaviour from unhealthy toward healthy is important and tends to be a sustainable way to reduce the growth rate of the obese population. This thesis tried to identify relevant determinants, which influence individual behaviour (i.e. healthy diet, regular exercise) to tackle the obesity problem. The first objective of the thesis was to explore how attitudes, social norms, habits, risk attitudes, time preferences, and socio-demographic and economic characteristics of participants recruited in this study influence WTP for the PN programme. The second objective was to evaluate whether stated behaviour and WTP for the programme was stable over time. The last objective was to assess how personality traits, time preferences, commitment, self-control, and BMI change can influence life satisfaction and weight goal achievement. All three objectives aim to answer our identified ten research questions (see Section 1.8 in Chapter 1).

5.1.2 Research design

To achieve all research questions, this thesis used mixed research design that explored the impact of social cognitive determinants and other interesting factors on purchasing behaviour both between-individual and within-individual level. The analysis of this study used longitudinal data, which were collected by face-to-face interview via a set of questionnaires. The first survey was collected during November and December in 2015, which applied the convenient sampling method to recruit participants working in Bangkok. The questionnaire of the first survey (see Appendix B) was developed including ten parts: 1) eating habits and health information, 2) goal setting and goal commitment (Hollenbeck *et al*., 1989), 3) scenario of personalised nutrition service, 4) the theory of trying, 5) resistance to eating temptation, 6) risk attitudes and time preference, 7) satisfaction, 8) big five inventory (John and Srivastava, 1999), 9) sensitivity to punishment and sensitivity to reward scale (Torrubia *et al*., 2001) 10) sensation seeking scale form v (Zuckerman, 1979; Zuckerman, 2007) and 11) demographic information. The participants who committed themselves by joining the project were contacted to be interviewed again 6 months later (during June and July in 2016). The set of questionnaire of the second survey (see Appendix C) included five parts: 1) eating habits and exercise, 2) goal setting and goal commitment, 3) resistance to eating temptation, 4) scenario of personalised nutrition service, 5) WTP elicitation, 6) the theory of trying, 7) risk attitudes and time preferences, and 8) satisfaction.

The contingent valuation survey was used to introduce the scenario of a personalised nutrition programme (PNP) that allowed us both to elicit attitudes toward PNP and captures willingness to pay (WTP) for PNP. To answer research question Q2 – Q9, this study quantitatively estimated the impact of interested determinants on WTP for PNP via the econometric models. To answer research question Q10, Structural Equation Modelling (SEM) was used to identify the relationship between time preferences, sensitivity to punishment, goal commitment, self-control (resistance to eating temptation), BMI change, satisfaction and achievement in weight goal.

5.1.3 Proposing the modelling behaviour via expectancy value model

The aim of Chapter 2 and Chapter 3 was to model purchasing behaviour by applying the concept of an expectancy value model. Chapter 2 aimed to answer research questions Q2, Q3 and Q4, i.e. Can existing models be extended to include economic

determinants and new psychological dimensions? What econometric models can be used to analyse cross-sectional data collected employing a combination of expectancy value and contingent valuation models? How well can attitudes, social norms, socio-demographic and economic characteristics predict intention to try and WTP for a PN programme?

To respond to these questions, we used the theory of trying (TOT) developed by Bagozzi and Warshaw (1990) to identify the social cognitive determinants, i.e. attitudes, norms, past behaviour to be proximal elements of WTP for PNP. We extended the TOT model by adding lists of other between-individual factors as distal elements (risk attitudes, time preferences, age, gender, education, employment) in the prediction of such WTP (see Figure 5.1). To evaluate this framework, we selected three econometric models, i.e. Interval regression model, Tobit model, Double hurdle model and Heckman sample selection model (HSSM) to compare the advantages and disadvantages of each model in predicting WTP for PNP. The findings highlighted that HSSM was outstanding over Tobit and Double hurdle models to predict the probability of intention toward trying PNP. Moreover, HSSM was able to simulate the impact of proximal elements on intention toward PNP, and also the impact of proximal elements and distal elements on WTP for PNP.

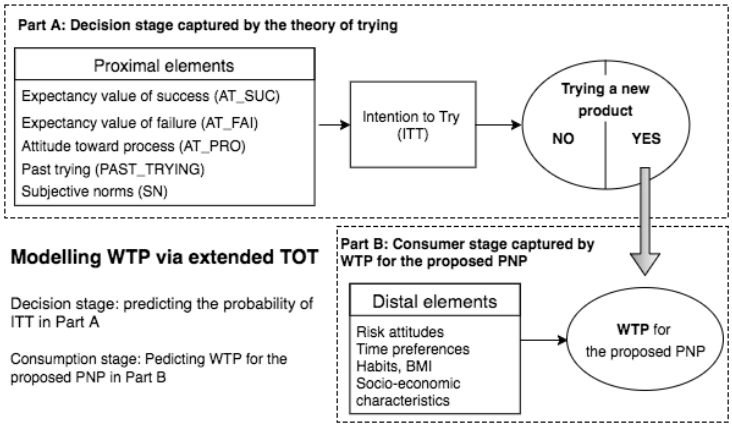


Figure 5.1 Modelling WTP for PNP via extended theory of trying

Chapter 3 aimed to answer research questions Q5, Q6, Q7, Q8 and Q9: What econometric models can be used to analyse longitudinal data collected employing a combination of expectancy value and contingent valuation models? How much are Thai citizens willing to pay for a PN programme helping them to achieve their weight goals?

How can within and between-individual factors influence WTP for a PN programme? Are purchasing intentions and WTP for a PN programme stable over time? What about attitude stability? The analysis used HSSM to estimate the impact of behavioural stability and other factors on WTP for PNP. We conducted four models to validate the application of HSSM via the expectancy value model and to estimate such impacts on WTP. The first model predicted WTP for PNP at time-0 and the second model predicted WTP for PNP at time-1. The third model used an average value between time-0 and time-1 of all proximal determinants, risk attitudes and time preferences. Then, a dummy of intention stability was added to predict WTP for PNP including other factors (i.e. age and income) constant over time. The final model used a different value between two periods (time-1 – time-0) and the dummy of intention stability to predict the change of WTP for PNP from time-0 to time-1. The findings of four HSSM models highlighted that behavioural intention changed over time and higher intention stability has an association with a higher increase in WTP for PNP. In contrast with the cognitions: attitudes, subjective norms and past behaviours, their change did not impact on the change in WTP for PNP.

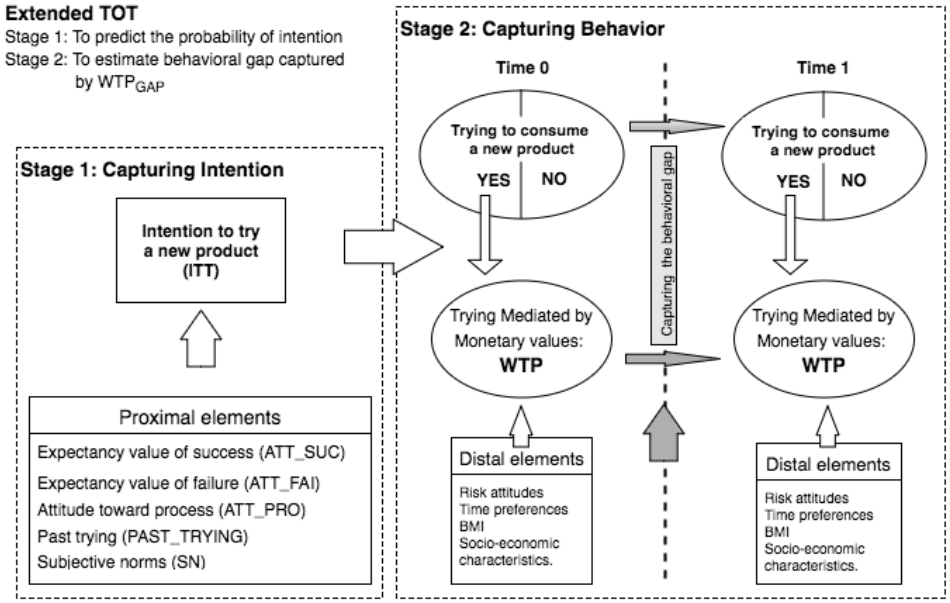


Figure 5.2 Capturing the behaviour gap via expectancy value model

5.1.4 Identifying the relationship between satisfaction and achievement

Chapter 4 aimed to answer research question Q10: What is the relationship between weight goal achievement and satisfaction? We aimed to understand the factors

influencing the outcome of trying to control the weight and the relationship between satisfaction and achievement. To achieve an answer to these questions, an inhibition facilitator commitment mechanism model was proposed to test via a recursive model. We tested the model by considering the relationship and interaction between time preferences, sensitivity to punishment, self-control, commitment, the change of body weight, satisfaction and weight goal achievement. The analysis started with exploratory factor analysis to identify items that had a high factor loading under the original constructs; then all constructs were validated through confirmatory factor analysis. SEM was used to validate and identify the path diagram of these constructs (see Figure 5.3). The SEM's findings highlighted that there was a reciprocal causation between satisfaction and weight goal achievement. Satisfactions had a positive impact on goal achievement. In contrast, goal achievement had a negative impact on satisfaction. Goal commitment was the critical factor, which increases self-control and the positive outcomes of goal achievement. On the other hand, a high level in time preferences and punishment sensitivity, and a low level in resistance eating temptation were the threats of BMI, satisfaction and achievement in weight goals.

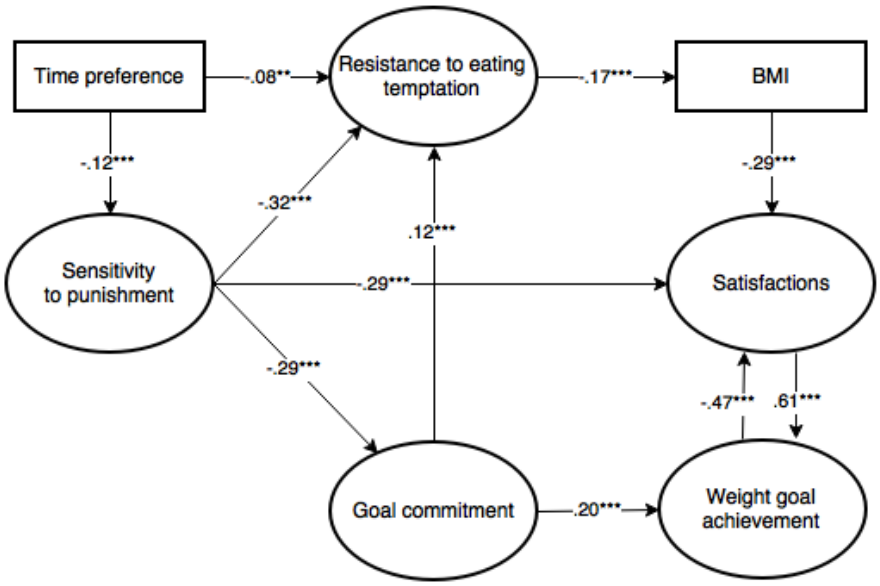


Figure 5.3 Path diagram for casual relation between satisfaction and achievement

5.2 Research contribution

Research contributions are divided into two aspects - the academic and the practical in nature.

5.2.1 Academic aspect

This thesis delivers contributions according to behavioural economics and social psychological literature. We proposed the modelling of behavioural stability via proximal and distal elements of an expectancy value model (the theory of trying). We also extended the TOT model proposed by Bagozzi and Warshaw in 1990 to explore interested between-individual factors which predict trying behaviour. We applied Heckman sample selection model to simulate the social cognitive determinants and other relevant factors in predicting behaviour, and to highlight the role of intention that bridge the relationship between social-cognitive determinants and behaviour. The empirical results of this thesis provide contributions to the existing personalised nutrition literature by applying contingent valuation survey to elicit attitudes toward PNP and WTP in Thailand. Last but not least, this thesis also provides contributions to the existing goal achievement literature by proposing the path diagram to understand the relationship between satisfaction, achievement and other relevant determinants dealing with attitudes and personality traits.

5.2.2 Practical aspect

1) Marketing

The results from evaluating WTP for PNP indicate that there is a potential market for PN advice in Thailand, particularly among high-class levels and employees working at private companies. The service may be the first launched in a niche market. For other consumer segments, the service can launch in the market and set the service charge starting at THB1200 for services twice a month. Another potential market is the group of people who used to try weight loss and failed. Their experience will facilitate the realised genetic condition that is a considerable obstacle to reach their goal. They will be more interested in the PNP and willing to try and pay for PNP. Marketers may offer the commercial promotion dealing with multiple payments or offer a discount for a lump sum payment. Discount promotion may motivate and arouse impatient people to try the service.

The findings also suggest that if we would like to help people to achieve their weight goals, the consultant should ask patients to commit and also identify their essential persons such as family members, friends or partners. These important persons may be invited to join as a part of intervention as network members who agree to provide support for such sustainable commitment. Moreover, during the intervention process, psychologists should be involved to evaluate patients' satisfaction in parallel with the dietary plan. The appraisal will provide useful information to maintain or increase satisfaction toward the positive outcome of weight goal achievement.

2) Policy recommendations

The Thai Ministry of Public Health can use these findings to advertise and promote PNP publicly or privately. For example, the Thai Health Promotion Foundation or private health care institutes might invest in the creation of multidisciplinary centres where collaboration among doctors, nutritionists and psychologists could help people to achieve weight goals using a PN service. The creation of these centres should be communicated with scientific information campaigns that could raise awareness about the possibility of using this technological service to tackle obesity and related diseases. Such social marketing campaigns could be based on information remedies, which highlight the success possibilities of this service encouraging Thai citizens to using personalised nutrition programmes. Thai Research Fund should provide grants to invite proposals from all kinds of researchers to explore more on PN and modify the food-based dietary guideline based on the PN concept, which can promote publicly in the future. This might be an important policy programme to prevent obesity and related diseases in Thailand. Actually, while costly treatment interventions for obesity-related diseases, such as hypertension, hearth diseases, diabetes, osteoarthritis and so on are included in the health benefits package, policy makers do not pay enough attention to programmes which can help to prevent this disease. On the other hand, a PNP might be very important especially for obese individuals without diseases who are still healthy and therefore need no treatment.

Furthermore, the Thai government should support manufactures and retailers to establish innovative supply chains delivering food for weight maintenance or products, which target specific nutritional needs of particular segments of consumers. These new food supply chains might be developed to deliver personalised food which can help Thai citizens to achieve weight goals in long run. However, from a policy point of view

the decision of whether the creation of these centres should be private, or public is an important point of discussion because our results indicate that the people who live in Bangkok, especially young people, self-employed and high-income people are likely to pay more for the proposed PNP illustrating a demand for PNP as niche market offered to high-class people.

Our findings indicate that the cost of this service is approximately THB 30,000 per six months (GBP 600), which seems expensive when taking into daily minimum wage. Government may propose a scheme based on the reduction of a corporate income tax to promote a mixed private/public health PN service on the Thai market. For example, the Thai Ministry of Public Health might consider including this service in public health programmes, which are not linked to the Universal Healthcare Coverage Scheme. The cost of this service might be subsidised partially in order to attract Thai citizens who could not afford the service according to WTP estimates obtained from this study. A minimum fee for PNP service might be set at THB 3,500 per six months or THB 585 per month and subsidise the cost for PN advice.

Prevention and treatment programmes like PN should be reinforced by other policies because in Thailand there are few national policies and activities to help obese people achieving losing weight and changing their unhealthy diet behaviour. For example, the national campaign “Ride for Mom and Dad”, launched in 2015 by the Crown Prince to promote the use of bicycle, is one of the few examples of national policies promoting physical activity to counteract obesity (Nanuam 2015; Online Reporters 2015). The Thai Ministry of Public Health should do more to increase social pressure and communicate how people can maintain weight or be committed to lose weight via social marketing campaigns. For instance, the Thai Health Promotion Foundation can use public media to promote continuously the ‘Fatless Belly Decreasing Diseases scheme’ because this can educate and motivate people both to be aware of unhealthy diet and obesity problems, and to increase their physical activities. The Ministry of Public Health should also re-launch the public campaign ‘half fruits and vegetables and half others’ for each meal via social media such as Facebook and Line application. Furthermore, the Thai Health Promotion Foundation could increase the budget to support social activities. Collaboration with sport clubs such as the Thai Jogging Club, Thai Cycling Club, Network of Fatless Belly Thais is important to organise weekly national public sport events which can help people to engage with physical activities

helping to tackle obesity and related diseases. Other Thai public health authorities and local government offices should re-organise regular physical activities, which were organised in 2013. This will provide opportunities for overweight and obese people to join those physical activity events. Last but not least, Thai Government should apply the project 'Ministry of Public Health's Executives with a Big Belly' launched in 2016 to encourage top leaders of other public organisations to control their weight. This might motivate officers to follow their leaders to control their weight.

5.3 Limitation and future research

This section will specify limitations to the research and highlight domains throughout the research thesis for the future research.

5.3.1 Data collection

As there was a limit of time and finance in conducting this longitudinal study, and this thesis used a very long questionnaire (22 pages) combined with a face-to-face interview for data collection, the convenience sampling method was used to require volunteers participating in this study. The sample could not well represent the population of Bangkok as same as of Thailand. Although the sample size seemed large (597 participants) and such sample was similar to the population in Bangkok for which they were drawn from income, they were more likely to be female and highly educated. The inclusion of individuals from other provinces would be encouraged. Future studies may consider exploring more diverse countries with different cultures to establish more comprehensive finding in PN advice. It would allow different lifestyles, social demographics and circumstances to be considered that would support the broader explanation of attitudes toward PNP service.

5.3.2 Questionnaire

Despite the fact that the SPSRQ developed by Torrubia *et al*. (2001) provides a degree of sensitivity to punishment (STP) representing the behavioural inhibition system (BIS), this self-assessment contains 24 items to measure STP, which appear to be very long as one part of the survey. Future research may consider the BIS/BAS scales of Carver and White (1994) to assess personality traits in the sensitivity to BIS or BAS systems. This construct contains only seven items for BIS and thirteen items for BAS. Another limitation of this study is the use of self-reported body weight for calculating

BMI because participants may under- or over-reported their weight in a way that directly influenced the outcome of their weight achievement. As a result, future research may directly measure weight and height when assessing weight goal achievement.

With regard to attitudes from the perspective of economics, this study applied the large gain aspect of SGG-panel lottery developed by Sabater-Grande and Georgantzis (2002) eliciting the degree of risk aversion. It would be interesting for future research to consider another aspect of SGG-panel lottery or to elicit loss aversion predicting willingness to pay. Consideration of a broader range of tools would provide a better understanding of consumer's purchase behaviour.

5.3.3 Individual differences

Even though personal details (e.g. age, gender, employment) and only one personality trait (sensitivity to punishments) were considered in this thesis, other personality traits were not considered. Future studies may investigate whether personal and individual differences (such as ethical considerations, the Big Five personality, and sensitivity to reward) influence purchasing behaviour and also weight goal achievement. If we can segment consumers on the basis of their personality traits, we can profoundly explore the influence of individual differences in purchasing behaviour. This approach may help to create sustainable strategies for public health, to increase demand for healthy food products, and to slow down the obesity epidemic.

5.3.4 Econometric Model

In this thesis, the Heckman sample selection model provides outstanding performance to explore the impact of cognitive determinants and other relevant between-individual factors and to predict the probability of intention toward behaviour. However, one drawback of this econometric model is to investigate the random effect for longitudinal data. It is difficult for this model to directly simulate both the effect of proximal elements on behaviour within an individual and the effect of such elements on behaviour between individuals. Future research may apply a multilevel regression analysis or random-effects regression model to simulate an expectancy value model via proximal and distal constructs in the prediction of behaviour.

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes,* 50, 179-211.

Ajzen, I. (2005). *Attitudes, Personality, and Behavior.* Milton Keynes: Open University.

Ajzen, I., Brown, T. C. & Carvajal, F. (2004). Explaining the discrepancy between intentions and actions: The case of hypothetical bias in contingent valuation. *Personality and Social Psychology Bulletin,* 30, 1108-1121.

Ajzen, I. & Driver, B. (1992a). Contingent value measurement: On the nature and meaning of willingness to pay. *Journal of Consumer Psychology,* 1, 297-316.

Ajzen, I. & Driver, B. L. (1992b). Application of the theory of planned behavior to leisure choice. *Journal of Leisure Research,* 24, 207.

Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour.* Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I. & Fishbein, M. (2005). The influence of attitudes on behavior. *The handbook of attitudes,* 173, 221.

Ajzen, I. & Fishbein, M. (2008). Scaling and testing multiplicative combinations in the expectancy–value model of attitudes. *Journal of Applied Social Psychology,* 38, 2222-2247.

Ajzen, I., Joyce, N., Sheikh, S. & Cote, N. G. (2011). Knowledge and the prediction of behavior: The role of information accuracy in the theory of planned behavior. *Basic and Applied Social Psychology,* 33, 101-117.

Alós-Ferrer, C. & Strack, F. (2014). From dual processes to multiple selves: Implications for economic behavior. *Journal of Economic Psychology,* 41, 1-11.

Amemiya, T. (1985). *Advanced econometrics.* Harvard university press.

Anderson, D. A., Lundgren, J. D., Shapiro, J. R. & Paulosky, C. A. (2003a). Weight Goals in a College-age Population. *Obesity Research,* 11, 274-278.

Anderson, L. A., Eyler, A. A., Galuska, D. A., Brown, D. R. & Brownson, R. C. (2002). Relationship of satisfaction with body size and trying to lose weight in a national survey of overweight and obese women aged 40 and older, United States. *Preventive Medicine,* 35, 390-396.

Anderson, L. R. & Mellor, J. M. (2008). Predicting health behaviors with an experimental measure of risk preference. *Journal of Health Economics,* 27, 1260-1274.

Anderson, P. M., Butcher, K. F. & Levine, P. B. (2003b). Maternal employment and overweight children. *Journal of Health Economics,* 22, 477-504.

Andrews, K. R., Silk, K. S. & Eneli, I. U. (2010). Parents as health promoters: A theory of planned behavior perspective on the prevention of childhood obesity. *Journal of Health Communication,* 15, 95-107.

Andreyeva, T., Kelly, I. R. & Harris, J. L. (2011). Exposure to food advertising on television: associations with children's fast food and soft drink consumption and obesity. *Economics & Human Biology,* 9, 221-233.

Andreyeva, T., Long, M. W. & Brownell, K. D. (2010). The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. *American Journal of Public Health,* 100, 216-222.

Arens, Z. G. & Hamilton, R. W. (2016). Why Focusing on the Similarity of Substitutes Leaves a Lot to Be Desired. *Journal of Consumer Research*, ucw034.

Armitage, C. J. (2004). Evidence that implementation intentions reduce dietary fat intake: a randomized trial. *Health Psychology,* 23, 319.

Armitage, C. J. & Conner, M. (1999). Distinguishing Perceptions of Control From Self-Efficacy: Predicting Consumption of a Low-Fat Diet Using the Theory of Planned Behavior1. *Journal of Applied Social Psychology,* 29, 72-90.

Armitage, C. J. & Conner, M. (2000). Social cognition models and health behaviour: A structured review. *Psychology and Health,* 15, 173-189.

Armitage, C. J. & Conner, M. (2001). Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology,* 40, 471-499.

Arvola, A., Vassallo, M., Dean, M., Lampila, P., Saba, A., Lähteenmäki, L. & Shepherd, R. (2008). Predicting intentions to purchase organic food: The role of affective and moral attitudes in the Theory of Planned Behaviour. *Appetite,* 50, 443-454.

Austin, J. T. & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. *Psychological Bulletin,* 120, 338.

Averett, S. L., Sikora, A. & Argys, L. M. (2008). For better or worse: relationship status and body mass index. *Economics & Human Biology,* 6, 330-349.

Avsar, G., Ham, R. & Tannous, W. K. (2017). Factors influencing the incidence of obesity in Australia: a generalized ordered probit model. *International journal of Environmental Research and Public Health,* 14, 177.

Bagozzi, R. P., Bergami, M. & Leone, L. (2003). Hierarchical representation of motives in goal setting. *Journal of Applied Psychology,* 88, 915.

Bagozzi, R. P. & Edwards, E. A. (1998). Goal setting and goal pursuit in the regulation of body weight. *Psychology and Health,* 13, 593-621.

Bagozzi, R. P., Moore, D. J. & Leone, L. (2004). Self-Control and the Self-Regulation of Dieting Decisions: The Role of Prefactual Attitudes, Subjective Norms, and Resistance to Temptation. *Basic and Applied Social Psychology,* 26, 199-213.

Bagozzi, R. P. & Warshaw, P. R. (1990). Trying to Consume. *Journal of Consumer Research,* 17, 127-140.

Bagozzi, R. P. & Yi, Y. (1989). The degree of intention formation as a moderator of the attitude-behavior relationship. *Social Psychology Quarterly*, 266-279.

Bagozzi, R. P. & Yi, Y. (1992). Testing hypotheses about methods, traits, and communalities in the direct-product model.

Bahr, D. B., Browning, R. C., Wyatt, H. R. & Hill, J. O. (2009). Exploiting social networks to mitigate the obesity epidemic. *Obesity,* 17, 723-728.

Baker, C. W., Little, T. D. & Brownell, K. D. (2003). Predicting adolescent eating and activity behaviors: the role of social norms and personal agency. *Health Psychology,* 22, 189.

Bamberg, S. (2002). Implementation intention versus monetary incentive comparing the effects of interventions to promote the purchase of organically produced food. *Journal of Economic Psychology,* 23, 573-587.

Bandura, A., Adams, N. E. & Beyer, J. (1977). Cognitive processes mediating behavioral change. *Journal of Personality and Social Psychology,* 35, 125.

Basu, S., McKee, M., Galea, G. & Stuckler, D. (2013). Relationship of soft drink consumption to global overweight, obesity, and diabetes: a cross-national analysis of 75 countries. *American Journal of Public Health,* 103, 2071-2077.

Batley, S. L., Fleming, P. D. & Urwin, P. (2000). Willingness to pay for renewable energy: Implications for UK green tariff offerings. *Indoor and Built Environment,* 9, 157-170.

Bellows, L., Moore, R. & Gross, A. (2014). Dietary Supplements: Vitamins and Minerals.

Bernard, J. C. & Bernard, D. J. (2009). What is it about organic milk? An experimental analysis. *American Journal of Agricultural Economics,* 91, 826-836.

Bernath, K. & Roschewitz, A. (2008). Recreational benefits of urban forests: explaining visitors' willingness to pay in the context of the theory of planned behavior. *Journal of Environmental Management,* 89, 155-166.

Bernier, M. & Avard, J. (1986). Self-efficacy, outcome, and attrition in a weight-reduction program. *Cognitive Therapy and Research,* 10, 319-338.

Berridge, K. C. (1996). Food reward: brain substrates of wanting and liking. *Neuroscience and Biobehavioral Reviews,* 20, 1-25.

Bertail, P. & Caillavet, F. (2008). Fruit and vegetable consumption patterns: a segmentation approach. *American Journal of Agricultural Economics,* 90, 827-842.

Blanchard, C. M., Kupperman, J., Sparling, P. B., Nehl, E., Rhodes, R. E., Courneya, K. S. & Baker, F. (2009). Do ethnicity and gender matter when using the theory of planned behavior to understand fruit and vegetable consumption? *Appetite,* 52, 15-20.

Bond, C. A., Cullen, K. G. & Larson, D. M. (2009). Joint estimation of discount rates and willingness to pay for public goods. *Ecological Economics,* 68, 2751-2759.

Bong Ko, S., Bong Ko, S., Jin, B. & Jin, B. (2017). Predictors of purchase intention toward green apparel products: A cross-cultural investigation in the USA and China. *Journal of Fashion Marketing and Management: An International Journal,* 21, 70-87.

Bowen, N. K. & Guo, S. (2011). *Structural equation modeling.* Oxford University Press.

Bradford, W. D. (2010). The association between individual time preferences and health maintenance habits. *Medical Decision Making,* 30, 99-112.

Brinkworth, G. D., Noakes, M., Buckley, J. D., Keogh, J. B. & Clifton, P. M. (2009). Long-term effects of a very-low-carbohydrate weight loss diet compared with an isocaloric low-fat diet after 12 mo. *The American Journal of Clinical Nutrition,* 90, 23-32.

Brownell, K. D., Marlatt, G. A., Lichtenstein, E. & Wilson, G. T. (1986). Understanding and preventing relapse. *American Psychologist,* 41, 765.

Brunstein, J. C. (1993). Personal goals and subjective well-being: A longitudinal study. *Journal of personality and social psychology,* 65, 1061.

Buglar, M. E., White, K. M. & Robinson, N. G. (2010). The role of self-efficacy in dental patients' brushing and flossing: testing an extended Health Belief Model. *Patient Education and Counseling,* 78, 269-272.

Burke, M. A. & Heiland, F. (2007). Social dynamics of obesity. *Economic Inquiry,* 45, 571-591.

Butland, B., Jebb, S., Kopelman, P., McPherson, K., Thomas, S., Mardell, J. & Parry, V. (2007). Foresight. Tackling obesities: future choices. Project report. *Foresight. Tackling obesities: future choices. Project report*.

Byrne, B. M. (2013). *Structural equation modeling with AMOS: Basic concepts, applications, and programming.* Routledge.

Cameron, T. A. & Huppert, D. D. (1989). OLS versus ML estimation of non-market resource values with payment card interval data. *Journal of Environmental Economics and Management,* 17, 230-246.

Capacci, S. & Mazzocchi, M. (2011). Five-a-day, a price to pay: an evaluation of the UK program impact accounting for market forces. *Journal of Health Economics,* 30, 87-98.

Carfora, V., Caso, D. & Conner, M. (2016). The role of self-identity in predicting fruit and vegetable intake. *Appetite,* 106, 23-29.

Carver, C. S. & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality–social, clinical, and health psychology. *Psychological Bulletin,* 92, 111.

Carver, C. S. & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: the BIS/BAS scales. *Journal of Personality and Social Psychology,* 67, 319.

Cawley, J. (2011). *The Oxford handbook of the social science of obesity.* Oxford University Press.

Cawley, J. & Liu, F. (2012). Maternal employment and childhood obesity: A search for mechanisms in time use data. *Economics & Human Biology,* 10, 352-364.

Celis-Morales, C., Livingstone, K. M., Marsaux, C. F., Macready, A. L., Fallaize, R., O'Donovan, C. B., Woolhead, C., Forster, H., Walsh, M. C. & Navas-Carretero, S. (2016). Effect of personalized nutrition on health-related behaviour change: evidence from the Food4me European randomized controlled trial. *International journal of Epidemiology*, dyw186.

Chabris, C. F., Laibson, D., Morris, C. L., Schuldt, J. P. & Taubinsky, D. (2008). Individual laboratory-measured discount rates predict field behavior. *Journal of Risk and Uncertainty,* 37, 237-269.

Chaxel, A.-S. (2016). Why, When, and How Personal Control Impacts Information Processing: A Framework. *Journal of Consumer Research,* 43, 179-197.

Christakis, N. A. & Fowler, J. H. (2007). The spread of obesity in a large social network over 32 years. *n engl j med,* 2007, 370-379.

Christian, T. & Rashad, I. (2009). Trends in US food prices, 1950–2007. *Economics & Human Biology,* 7, 113-120.

Cialdini, R. B. (2001). Science and practice.

Clark, M. M., Abrams, D. B., Niaura, R. S., Eaton, C. A. & Rossi, J. S. (1991). Self-efficacy in weight management. *Journal of Consulting and Clinical Psychology,* 59, 739.

Clifton, P. M., Keogh, J. B. & Noakes, M. (2008). Long-term effects of a high-protein weight-loss diet. *The American Journal of Clinical Nutrition,* 87, 23-29.

Conner, M. & Godin, G. (2007). Temporal stability of behavioural intention as a moderator of intention–health behaviour relationships. *Psychology and Health,* 22, 875-897.

Conner, M., Martin, E., Silverdale, N. & Grogan, S. (1996). Dieting in adolescence: An application of the theory of planned behaviour. *British Journal of Health Psychology,* 1, 315-325.

Conner, M., McEachan, R., Lawton, R. & Gardner, P. (2016). Basis of intentions as a moderator of the intention–health behavior relationship. *Health Psychology,* 35, 219.

Conner, M. & Norman, P. (2005). *Predicting health behaviour.* McGraw-Hill Education (UK).

Conner, M., Norman, P. & Bell, R. (2002). The theory of planned behavior and healthy eating. *Health Psychology,* 21, 194.

Conner, M., Warren, R., Close, S. & Sparks, P. (1999). Alcohol consumption and the theory of planned behavior: An examination of the cognitive mediation of past behaviorid. *Journal of Applied Social Psychology,* 29, 1676-1704.

Cooke, R., Sniehotta, F. & Schüz, B. (2007). Predicting binge-drinking behaviour using an extended TPB: Examining the impact of anticipated regret and descriptive norms. *Alcohol and Alcoholism,* 42, 84-91.

Courtemanche, C. (Year). Longer hours and larger waistlines? The relationship between work hours and obesity. *In:* Forum for Health Economics & Policy, 2009.

Courtemanche, C., Heutel, G. & McAlvanah, P. (2015). Impatience, incentives and obesity. *The Economic Journal,* 125, 1-31.

Cragg, J. G. (1971). Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica: Journal of the Econometric Society*, 829-844.

Craig, P., Swinburn, B., Matenga-Smith, T., Matangi, H. & Vaughn, G. (1996). Do Polynesians still believe that big is beautiful? Comparison of body size perceptions and preferences of Cook Islands, Maori and Australians. *The New Zealand Medical Journal,* 109, 200-203.

Cross, C. P., Copping, L. T. & Campbell, A. (2011). Sex differences in impulsivity: a meta-analysis. *Psychological Bulletin,* 137, 97.

Curb, J. D. & Marcus, E. B. (1991). Body fat and obesity in Japanese Americans. *The American Journal of Clinical Nutrition,* 53, 1552S-1555S.

Dardanoni, V. & Wagstaff, A. (1990). Uncertainty and the demand for medical care. *Journal of Health Economics,* 9, 23-38.

Darmon, N. & Drewnowski, A. (2008). Does social class predict diet quality? *The American Journal of Clinical Nutrition,* 87, 1107-1117.

Davis, C. & Fox, J. (2008). Sensitivity to reward and body mass index (BMI): Evidence for a non-linear relationship. *Appetite,* 50, 43-49.

Davis, C., Patte, K., Levitan, R., Reid, C., Tweed, S. & Curtis, C. (2007). From motivation to behaviour: A model of reward sensitivity, overeating, and food preferences in the risk profile for obesity. *Appetite,* 48, 12-19.

Davis, C., Shapiro, C. M., Elliott, S. & Dionne, M. (1993). Personality and other correlates of dietary restraint: An age by sex comparison. *Personality and Individual Differences,* 14, 297-305.

Davis, C., Strachan, S. & Berkson, M. (2004a). Sensitivity to reward: implications for overeating and overweight. *Appetite,* 42, 131-138.

Davis, C. & Woodside, D. B. (2002). Sensitivity to the rewarding effects of food and exercise in the eating disorders. *Comprehensive Psychiatry,* 43, 189-194.

Davis, F. D. & Warshaw, P. R. (1992). What do intention scales measure? *The Journal of General Psychology,* 119, 391-407.

Davis, J., Busch, J., Hammatt, Z., Novotny, R., Harrigan, R., Grandinetti, A. & Easa, D. (2004b). The relationship between ethnicity and obesity in Asian and Pacific Islander populations: a literature review. *Ethnicity & disease,* 14, 111-118.

De Bruijn, G.-J. (2010). Understanding college students' fruit consumption. Integrating habit strength in the theory of planned behaviour. *Appetite,* 54, 16-22.

de Oliveira, A. C., Leonard, T. C., Shuval, K., Skinner, C. S., Eckel, C. & Murdoch, J. C. (2015). Economic preferences and obesity among a low-income African American community. *Journal of Economic Behavior & Organization*.

De Vet, E., Nelissen, R. M., Zeelenberg, M. & De Ridder, D. T. (2013). Ain't no mountain high enough? Setting high weight loss goals predict effort and short-term weight loss. *Journal of Health Psychology,* 18, 638-647.

Dean, M., Raats, M. M. & Shepherd, R. (2012). The role of self-identity, past behavior, and their interaction in predicting intention to purchase fresh and processed organic food. *Journal of Applied Social Psychology,* 42, 669-688.

Deci, E. L. & Ryan, R. M. (2000). The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry,* 11, 227-268.

DeHart, D. D. & Birkimer, J. C. (1997). Trying to practice safer sex: Development of the sexual risks scale. *Journal of Sex Research,* 34, 11-25.

Diener, E. & Suh, E. (1997). Measuring quality of life: Economic, social, and subjective indicators. *Social Indicators Research,* 40, 189-216.

Diener, E., Suh, E. M., Lucas, R. E. & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin,* 125, 276-302.

Dietrich, A., Federbusch, M., Grellmann, C., Villringer, A. & Horstmann, A. (2014). Body weight status, eating behavior, sensitivity to reward/punishment, and gender: relationships and interdependencies. *Frontiers in Psychology,* 5.

Dowd, A. J., Chen, M. Y., Schmader, T., Jung, M. E., Zumbo, B. D. & Beauchamp, M. R. (2016). Psychosocial predictors of changes in adolescent girls' physical activity and dietary behaviors over the course of the Go Girls! group-based mentoring program. *Health Education Research,* 31, 478-491.

Dowd, K. & Burke, K. J. (2013). The influence of ethical values and food choice motivations on intentions to purchase sustainably sourced foods. *Appetite,* 69, 137-144.

Dunn, K. I., Mohr, P., Wilson, C. J. & Wittert, G. A. (2011). Determinants of fast-food consumption. An application of the Theory of Planned Behaviour. *Appetite,* 57, 349-357.

Earl, P. E. (1990). Economics and psychology: a survey. *The Economic Journal,* 100, 718-755.

Earl, P. E. (2005). Economics and psychology in the twenty-first century. *Cambridge Journal of Economics,* 29, 909-926.

Eckes, T. & Six, B. (1994). Fakten und Fiktionen in der Einstellungs-Verhaltens-Forschung: Eine Meta-Analyse. *Zeitschrift für Sozialpsychologie*.

Ehrlich, I. & Chuma, H. (1990). A Model of the Demand for Longevity and the Value of Life Extension. *Journal of Political Economy*, 761-782.

Elliot, A. J. & Thrash, T. M. (2002). Approach-avoidance motivation in personality: approach and avoidance temperaments and goals. *Journal of Personality and Social Psychology,* 82, 804.

Emanuel, A. S., McCully, S. N., Gallagher, K. M. & Updegraff, J. A. (2012). Theory of Planned Behavior explains gender difference in fruit and vegetable consumption. *Appetite,* 59, 693-697.

Emmons, R. A. (1996). Striving and feeling: Personal goals and subjective well-being.

Fabricatore, A., Wadden, T., Womble, L., Sarwer, D., Berkowitz, R., Foster, G. & Brock, J. (2007). The role of patients' expectations and goals in the behavioral and pharmacological treatment of obesity. *International Journal of Obesity,* 31, 1739-1745.

Fabricatore, A. N., Wadden, T. A., Rohay, J. M., Pillitteri, J. L., Shiffman, S., Harkins, A. M. & Burton, S. L. (2008). Weight loss expectations and goals in a population sample of overweight and obese US adults. *Obesity,* 16, 2445-2450.

Faith, M. S., Flint, J., Fairburn, C. G., Goodwin, G. M. & Allison, D. B. (2001). Gender differences in the relationship between personality dimensions and relative body weight. *Obesity Research,* 9, 647-650.

Fallaize, R., Macready, A., Butler, L., Ellis, J. & Lovegrove, J. (2013). An insight into the public acceptance of nutrigenomic-based personalised nutrition. *Nutrition Research Reviews,* 26, 39-48.

Ferguson, L. R. & Philpott, M. (2005). New Zealand-Fertile ground for functional foods and nutrigenomics. *Current Topics in Nutraceutical Research,* 3, 199.

Finch, E. A., Linde, J. A., Jeffery, R. W., Rothman, A. J., King, C. M. & Levy, R. L. (2005). The effects of outcome expectations and satisfaction on weight loss and maintenance: correlational and experimental analyses-a randomized trial. *Health Psychology,* 24, 608.

Finkelstein, E. A. & Strombotne, K. L. (2010). The economics of obesity. *The American Journal of Clinical Nutrition,* 91, 1520S-1524S.

Fischer, A. R., Berezowska, A., Van Der Lans, I. A., Ronteltap, A., Rankin, A., Kuznesof, S., Poínhos, R., Stewart-Knox, B. & Frewer, L. J. (2016). Willingness to pay for personalised nutrition across Europe. *The European Journal of Public Health,* 26, 640-644.

Fishbein, M. & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach.* Taylor & Francis.

Fleming, M. L., Barner, J. C., Brown, C. M., Shepherd, M. D., Strassels, S. & Novak, S. (2014). Using the theory of planned behavior to examine pharmacists' intention to utilize a prescription drug monitoring program database. *Research in Social and Administrative Pharmacy,* 10, 285-296.

Food4Me. (2011). *About the Food4Me Project*. URL: http://www.food4me.org/about/about-the-food4me-project [24 March].

Fowler, J. H. & Christakis, N. A. (2008). Estimating peer effects on health in social networks: A response to Cohen-Cole and Fletcher; Trogdon, Nonnemaker, Pais. *Journal of Health Economics,* 27, 1400.

Fox, J. A. (2013). Risk Preferences and Food Consumption. *In:* Lusk, J. e. a. (ed.) *The Oxford Handbook of the Economics of Food Consumption and Policy.* 1st ed. Croydon: CPI Group (UK).

Franco, M., Orduñez, P., Caballero, B., Tapia Granados, J. A., Lazo, M., Bernal, J. L., Guallar, E. & Cooper, R. S. (2007). Impact of energy intake, physical activity, and population-wide weight loss on cardiovascular disease and diabetes mortality in Cuba, 1980–2005. *American Journal of Epidemiology,* 166, 1374-1380.

Franken, I. H. A. & Muris, P. (2005). Individual differences in reward sensitivity are related to food craving and relative body weight in healthy women. *Appetite,* 45, 198-201.

French, D. P. & Cooke, R. (2012). Using the theory of planned behaviour to understand binge drinking: The importance of beliefs for developing interventions. *British journal of Health Psychology,* 17, 1-17.

Frey, B. S. & Stutzer, A. (2007). *Economics and psychology: a promising new cross-disciplinary field.* Mit Press Cambridge, MA.

Garcia, J. & Quintana-Domeque, C. (2006). Obesity, employment and wages in Europe. *The Economics of Obesity.* Emerald Group Publishing Limited.

Giammattei, J., Blix, G., Marshak, H. H., Wollitzer, A. O. & Pettitt, D. J. (2003). Television watching and soft drink consumption: associations with obesity in

11-to 13-year-old schoolchildren. *Archives of Pediatrics & Adolescent Medicine,* 157, 882-886.

Giskes, K., van Lenthe, F., Avendano-Pabon, M. & Brug, J. (2011). A systematic review of environmental factors and obesogenic dietary intakes among adults: are we getting closer to understanding obesogenic environments? *Obesity Reviews,* 12, e95-e106.

Glanz, K., Rimer, B. K. & Viswanath, K. (2008). *Health behavior and health education: theory, research, and practice.* John Wiley & Sons.

Godfray, H. C. J., Beddington, J. R., Crute, I. R., Haddad, L., Lawrence, D., Muir, J. F., Pretty, J., Robinson, S., Thomas, S. M. & Toulmin, C. (2010). Food security: the challenge of feeding 9 billion people. S*cience,* 327, 812-818.

Gollwitzer, P. M. & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology,* 73, 186.

Gould, S. J., Houston, F. S. & Mundt, J. (1997). Failing to try to consume: a reversal of the usual consumer research perspective. *NA-Advances in Consumer Research Volume 24*.

Gray, J. A. (1970). The psychophysiological basis of introversion-extraversion. *Behaviour Research and Therapy,* 8, 249-266.

Gray, J. A. (1981). A critique of Eysenck's theory of personality. *A model for personality.* Springer.

Gray, J. A. (1987). Perspectives on anxiety and impulsivity: A commentary. *Journal of Research in Personality,* 21, 493-509.

Gray, J. A. (1991). *The psychology of fear and stress.* 2nd ed. Musselburgh: CUP Archive.

Greene, W. H. (2012). *Econometric analysis.* 7th ed.: Pearson Education India.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy,* 80, 223-255.

Guan, M., Coles, V. B., Samp, J. A., Sales, J. M., DiClemente, R. J. & Monahan, J. L. (2016). Incorporating communication into the Theory of Planned Behavior to predict condom use among African American Women. *Journal of Health Communication,* 21, 1046-1054.

Hackman, C. L. & Knowlden, A. P. (2014). Theory of reasoned action and theory of planned behavior-based dietary interventions in adolescents and young adults: a systematic review. *Adolescent Health, Medicine and Therapeutics,* 5, 101.

Hagger, M. S., Chatzisarantis, N. L. & Biddle, S. J. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology,* 24, 3-32.

Hair, J. F. (2014). *Multivariate data analysis.* Pearson College Division.

Hall, K. D., Stephen, A. M., Reeder, B. A., Muhajarine, N. & Lasiuk, G. (2003). Diet, obesity and education in three age groups of Saskatchewan women. *Canadian Journal of Dietetic Practice and Research,* 64, 181-188.

Halstead, J. M., Lindsay, B. E. & Brown, C. M. (1991). Use of the Tobit model in contingent valuation: experimental evidence from the Pemigewasset Wilderness Area. *Journal of Environmental Management,* 33, 79-89.

Harris, C. C., Driver, B. L. & McLaughlin, W. J. (1989). Improving the contingent valuation method: a psychological perspective. *Journal of Environmental Economics and Management,* 17, 213-229.

Harrison, A., O'Brien, N., Lopez, C. & Treasure, J. (2010). Sensitivity to reward and punishment in eating disorders. *Psychiatry Research,* 177, 1-11.

Hart, W., Albarracín, D., Eagly, A. H., Brechan, I., Lindberg, M. J. & Merrill, L. (2009). Feeling validated versus being correct: a meta-analysis of selective exposure to information. *Psychological Bulletin,* 135, 555.

Heaven, P. C., Mulligan, K., Merrilees, R., Woods, T. & Fairooz, Y. (2001). Neuroticism and conscientiousness as predictors of emotional, external, and restrained eating behaviors. *International Journal of Eating Disorders,* 30, 161-166.

Heckman, J. (1974). Shadow prices, market wages, and labor supply. *Econometrica: Journal of the Econometric Society*, 679-694.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica: Journal of the Econometric Society*, 153-161.

Hedeker, D., Flay, B. R. & Petraitis, J. (1996). Estimating individual influences of behavioral intentions: An application of random-effects modeling to the theory of reasoned action. *Journal of Consulting and Clinical Psychology,* 64, 109.

Hee, Y. K. & Jae-Eun, C. (2011). Consumer purchase intention for organic personal care products. *Journal of Consumer Marketing,* 28, 40-47.

Heinberg, L. J., Thompson, J. K. & Matzon, J. L. (2001). Body image dissatisfaction as a motivator for healthy lifestyle change: Is some distress beneficial?

Heshmat, S. (2006). Applying behavioral economics to changing health behavior: The case of weight-loss management. *Californian Journal of Health Promotion,* 4, 21-29.

Heshmat, S. (2011). *Eating behavior and obesity: Behavioral economics strategies for health professionals.* Springer Publishing Company.

Hill, J. O. & Peters, J. C. (1998). Environmental contributions to the obesity epidemic. *Science,* 280, 1371-1374.

Hintsanen, M., Jokela, M., Cloninger, C. R., Pulkki-Råback, L., Hintsa, T., Elovainio, M., Josefsson, K., Rosenström, T., Mullola, S. & Raitakari, O. T. (2012). Temperament and character predict body-mass index: A population-based prospective cohort study. *Journal of Psychosomatic Research,* 73, 391-397.

Hoch, S. J. & Loewenstein, G. F. (1991). Time-inconsistent preferences and consumer self-control. *Journal of Consumer Research,* 17, 492-507.

Hollenbeck, J. R., Klein, H. J., O'Leary, A. M. & Wright, P. M. (1989). Investigation of the construct validity of a self-report measure of goal commitment. *Journal of Applied Psychology,* 74, 951.

Honkanen, P., Verplanken, B. & Olsen, S. O. (2006). Ethical values and motives driving organic food choice. *Journal of Consumer Behaviour,* 5, 420-430.

Hsu, J.-Y. & Yen, H.-L. (2012). Customers' Adoption Factors and Willingness to Pay for Home Energy Information Management System in Taiwan. *International proceedings of computer science and information technology,* 45, 11-16.

Hu, F. (2008). *Obesity epidemiology.* Oxford University Press.

Hu, L. t. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: a Multidisciplinary Journal,* 6, 1-55.

Ikeda, S., Kang, M.-I. & Ohtake, F. (2010). Hyperbolic discounting, the sign effect, and the body mass index. *Journal of Health Economics,* 29, 268-284.

Jeffery, R. W. & Rick, A. M. (2002). Cross-sectional and longitudinal associations between body mass index and marriage-related factors. *Obesity,* 10, 809-815.

Jeffrey, R. W., Wing, R. R. & Mayer, R. R. (1998). Are smaller weight losses or more achievable weight loss goals better in the long term for obese patients? *Journal of Consulting and Clinical Psychology,* 66, 641.

Johannesson, M. & Johansson, P.-O. (1996). To be, or not to be, that is the question: an empirical study of the WTP for an increased life expectancy at an advanced age. *Journal of Risk and Uncertainty,* 13, 163-174.

Johannesson, M. & Johansson, P.-O. (1997). Quality of life and the WTP for an increased life expectancy at an advanced age. *Journal of Public Economics,* 65, 219-228.

John, O. P. & Srivastava, S. (1999). *The Big Five trait taxonomy: History, measurement, and theoretical perspectives.* 2 ed. New York: Guilford Press.

Jokela, M., Hintsanen, M., Hakulinen, C., Batty, G. D., Nabi, H., Singh-Manoux, A. & Kivimäki, M. (2013). Association of personality with the development and persistence of obesity: a meta-analysis based on individual–participant data. *Obesity Reviews,* 14, 315-323.

Joost, H.-G., Gibney, M. J., Cashman, K. D., Görman, U., Hesketh, J. E., Mueller, M., van Ommen, B., Williams, C. M. & Mathers, J. C. (2007). Personalised nutrition: status and perspectives. *British Journal of Nutrition,* 98, 26-31.

Jun, J. & Arendt, S. W. (2016). Understanding healthy eating behaviors at casual dining restaurants using the extended theory of planned behavior. *International Journal of Hospitality Management,* 53, 106-115.

Just, D. R. & Payne, C. R. (2009). Obesity: can behavioral economics help? *Annals of Behavioral Medicine,* 38, 47-55.

Kahneman, D. (2011). *Thinking, fast and slow.* Macmillan.

Karnani, A., McFerran, B. & Mukhopadhyay, A. (2016). The obesity crisis as market failure: An analysis of systemic causes and corrective mechanisms. *Journal of the Association for Consumer Research,* 1, 445-470.

Kerr, G. & Cullen, R. (1995). Public preferences and efficient allocation of a possum-control budget. *Journal of Environmental Management,* 43, 1-15.

Kim, J. & Park, H.-A. (2012). Development of a health information technology acceptance model using consumers' health behavior intention. *Journal of Medical Internet Research,* 14.

Kim, Y. J., Njite, D. & Hancer, M. (2013). Anticipated emotion in consumers' intentions to select eco-friendly restaurants: Augmenting the theory of planned behavior. *International Journal of Hospitality Management,* 34, 255-262.

Kirby, J. B., Liang, L., Chen, H.-J. & Wang, Y. (2012). Race, place, and obesity: the complex relationships among community racial/ethnic composition, individual race/ethnicity, and obesity in the United States. *American Journal of Public health,* 102, 1572-1578.

Kleanthous, K., Dermitzaki, E., Papadimitriou, D. T., Papaevangelou, V. & Papadimitriou, A. (2016). Overweight and obesity decreased in Greek schoolchildren from 2009 to 2012 during the early phase of the economic crisis. *Acta Paediatrica,* 105, 200-205.

Klein, H. J., Wesson, M. J., Hollenbeck, J. R. & Alge, B. J. (1999). Goal commitment and the goal-setting process: conceptual clarification and empirical synthesis. *Journal of Applied Psychology,* 84, 885.

Klein, H. J., Wesson, M. J., Hollenbeck, J. R., Wright, P. M. & DeShon, R. P. (2001). The assessment of goal commitment: A measurement model meta-analysis. *Organizational Behavior and Human Decision Processes,* 85, 32-55.

Kline, R. B. (2011). *Principles and practice of structural equation modeling.* Guilford publications.

Komduur, R. H., Korthals, M. & Te Molder, H. (2008). The good life: living for health and a life without risks? On a prominent script of nutrigenomics. *British Journal of Nutrition,* 101, 307-316.

Komlos, J., Smith, P. K. & Bogin, B. (2004). Obesity and the rate of time preference: is there a connection? *Journal of Biosocial Science,* 36, 209-219.

Korkeila, M., Kaprio, J., Rissanen, A., Koskenvuo, M. & Sörensen, T. (1998). Predictors of major weight gain in adult Finns: stress, life satisfaction and personality traits. *International Journal of Obesity,* 22, 949-957.

Kothe, E. J., Mullan, B. & Butow, P. (2012). Promoting fruit and vegetable consumption. Testing an intervention based on the theory of planned behaviour. *Appetite,* 58, 997-1004.

Kroshus, E., Baugh, C. M., Daneshvar, D. H. & Viswanath, K. (2014). Understanding concussion reporting using a model based on the theory of planned behavior. *Journal of Adolescent Health,* 54, 269-274. e2.

Lämmle, L., Woll, A., Mensink, G. & Bös, K. (2013). Distal and proximal factors of health behaviors and their associations with health in children and adolescents. *International Journal of Environmental Research and Public Health,* 10, 2944-2978.

Lash, D. N., Smith, J. E. & Rinehart, J. K. (2016). Can the Theory of Planned Behavior predict dietary intention and future dieting in an ethnically diverse sample of overweight and obese veterans attending medical clinics? *Appetite,* 99, 185-192.

Lawless, L., Drichoutis, A. C. & Nayga Jr, R. M. (2013). Time preferences and health behaviour: a review. *Agricultural and Food Economics,* 1, 1-19.

Lawless, L. J., Drichoutis, A., Nayga, R. M., Threlfall, R. T. & Meullenet, J.-F. (2015). Identifying Product Attributes and Consumer Attitudes that Impact Willingness to pay for a Nutraceutical-Rich Juice Product. *Journal of Sensory Studies,* 30, 156-168.

Leahey, T. M., LaRose, J. G., Fava, J. L. & Wing, R. R. (2011). Social influences are associated with BMI and weight loss intentions in young adults. *Obesity,* 19, 1157-1162.

Lechene, V. (2000). Income and price elasticities of demand for foods consumed in the home. *National Food Survey: 2000*, 89-109.

Leonard, T., Shuval, K., de Oliveira, A., Skinner, C. S., Eckel, C. & Murdoch, J. C. (2013). Health behavior and behavioral economics: economic preferences and physical activity stages of change in a low-income African-American community. *American Journal of Health Promotion,* 27, 211-221.

Lim, L., Seubsman, S.-a. & Sleigh, A. (2009). Validity of self-reported weight, height, and body mass index among university students in Thailand: Implications for population studies of obesity in developing countries. *Population Health Metrics,* 7, 15.

Lim, S.-L. & Bruce, A. S. (2015). Prospect theory and body mass: characterizing psychological parameters for weight-related risk attitudes and weight-gain aversion. *Frontiers in Psychology,* 6.

Linde, J. A., Jeffery, R. W., Finch, E. A., Ng, D. M. & Rothman, A. J. (2004). Are unrealistic weight loss goals associated with outcomes for overweight women? *Obesity Research,* 12, 569-576.

Ljungvall, Å. & Gerdtham, U.-G. (2010). More equal but heavier: a longitudinal analysis of income-related obesity inequalities in an adult Swedish cohort. *Social Science & Medicine,* 70, 221-231.

Locke, E. A., Bryan, J. F. & Kendall, L. M. (1968). Goals and intentions as mediators of the effects of monetary incentives on behavior. *Journal of Applied Psychology,* 52, 104.

Locke, E. A. & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist,* 57, 705.

Locke, E. A., Shaw, K. N., Saari, L. M. & Latham, G. P. (1981). Goal setting and task performance: 1969–1980. *Psychological Bulletin,* 90, 125.

López-Mosquera, N. (2016). Gender differences, theory of planned behavior and willingness to pay. *Journal of Environmental Psychology,* 45, 165-175.

López-Mosquera, N., García, T. & Barrena, R. (2014). An extension of the Theory of Planned Behavior to predict willingness to pay for the conservation of an urban park. *Journal of Environmental Management,* 135, 91-99.

López-Mosquera, N. & Sánchez, M. (2012). Theory of Planned Behavior and the Value-Belief-Norm Theory explaining willingness to pay for a suburban park. *Journal of Environmental Management,* 113, 251-262.

Loxton, N. J. & Dawe, S. (2001). Alcohol abuse and dysfunctional eating in adolescent girls: The influence of individual differences in sensitivity to reward and punishment. *International Journal of Eating Disorders,* 29, 455-462.

Ludwig, D. S., Peterson, K. E. & Gortmaker, S. L. (2001). Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *The Lancet,* 357, 505-508.

Lusk, J. L. & Coble, K. H. (2005). Risk perceptions, risk preference, and acceptance of risky food. *American Journal of Agricultural Economics,* 87, 393-405.

Luzar, E. J. & Cosse, K. J. (1998). Willingness to pay or intention to pay: the attitude-behavior relationship in contingent valuation. *The Journal of Socio-Economics,* 27, 427-444.

Macdonald, S. M., Reeder, B. A., Chen, Y. & Despres, J.-P. (1997). Obesity in Canada: a descriptive analysis. Canadian Heart Health Surveys Research Group. *CMAJ: Canadian Medical Association Journal,* 157, S3-9.

Madden, D. (2008). Sample selection versus two-part models revisited: The case of female smoking and drinking. *Journal of Health Economics,* 27, 300-307.

Manfredini, R., De Giorgi, A., Tiseo, R., Boari, B., Cappadona, R., Salmi, R., Gallerani, M., Signani, F., Manfredini, F. & Mikhailidis, D. P. (2017). Marital status, cardiovascular diseases, and cardiovascular risk factors: A review of the evidence. *Journal of Women's Health*.

Mann, T., Tomiyama, A. J., Westling, E., Lew, A.-M., Samuels, B. & Chatman, J. (2007). Medicare's search for effective obesity treatments: diets are not the answer. *American Psychologist,* 62, 220.

Marmot, M., Friel, S., Bell, R., Houweling, T. A., Taylor, S. & Health, C. o. S. D. o. (2008). Closing the gap in a generation: health equity through action on the social determinants of health. *The Lancet,* 372, 1661-1669.

Marti, A., Moreno-Aliaga, M., Hebebrand, J. & Martinez, J. (2004). Genes, lifestyles and obesity. *International Journal of Obesity,* 28, S29-S36.

Martín, A. R., Nieto, J. M. M., Ruiz, J. P. N. & Jiménez, L. E. (2008). Overweight and obesity: the role of education, employment and income in Spanish adults. *Appetite,* 51, 266-272.

Mas-Colell, A., Whinston, M. D. & Green, J. R. (1995). *Microeconomic theory.* Oxford university press New York.

Mazzocchi, M., Traill, W. B. & Shogren, J. F. (2009). *Fat economics: nutrition, health, and economic policy.* Oxford University Press.

McCare, R. R. & Costa, P. T. (1990). *Personality in Adulthood.* New York: The Guilford Press.

McCrae, R. R. & Costa Jr, P. T. (1999). A five-factor theory of personality. *Handbook of personality: Theory and Research,* 2, 139-153.

McDonald, J. F. & Moffitt, R. A. (1980). The uses of Tobit analysis. *The Review of Economics and Statistics*, 318-321.

McEachan, R. R. C., Conner, M., Taylor, N. J. & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the theory of planned behaviour: A meta-analysis. *Health Psychology Review,* 5, 97-144.

McGuire, M. T., Wing, R. R., Klem, M. L., Lang, W. & Hill, J. O. (1999). What predicts weight regain in a group of successful weight losers? *Journal of Consulting and Clinical Psychology,* 67, 177.

McLaren, L. (2007). Socioeconomic status and obesity. *Epidemiologic Reviews,* 29, 29-48.

McLaren, L., Hardy, R. & Kuh, D. (2003). Women's body satisfaction at midlife and lifetime body size: A prospective study. *Health Psychology,* 22, 370.

McLaren, L. & Kuh, D. (2004). Women's body dissatisfaction, social class, and social mobility. *Social Science & Medicine,* 58, 1575-1584.

Mendez, M., Cooper, R., Luke, A., Wilks, R., Bennett, F. & Forrester, T. (2004). Higher income is more strongly associated with obesity than with obesity-related metabolic disorders in Jamaican adults. *International Journal of Obesity,* 28, 543-550.

Messier, S. P., Loeser, R. F., Miller, G. D., Morgan, T. M., Rejeski, W. J., Sevick, M. A., Ettinger, W. H., Pahor, M. & Williamson, J. D. (2004). Exercise and dietary weight loss in overweight and obese older adults with knee osteoarthritis: the Arthritis, Diet, and Activity Promotion Trial. *Arthritis & Rheumatism,* 50, 1501-1510.

Meyerhoff, J. (2006). Stated willingness to pay as hypothetical behaviour: Can attitudes tell us more? *Journal of Environmental Planning and Management,* 49, 209-226.

Monsivais, P., Mclain, J. & Drewnowski, A. (2010). The rising disparity in the price of healthful foods: 2004–2008. *Food Policy,* 35, 514-520.

Monteiro, C. A., Conde, W. L. & Popkin, B. M. (2007). Income-specific trends in obesity in Brazil: 1975–2003. *American Journal of Public Health,* 97, 1808-1812.

Morris, S. (2006). Body mass index and occupational attainment. *Journal of Health Economics,* 25, 347-364.

Morris, S. (2007). The impact of obesity on employment. *Labour Economics,* 14, 413-433.

Mullan, B., Allom, V., Sainsbury, K. & Monds, L. A. (2015). Examining the predictive utility of an extended theory of planned behaviour model in the context of specific individual safe food-handling. *Appetite,* 90, 91-98.

Nanuam, W. (2015). “Prince to Lead Bike Ride for Her Majesty.” *Bangkok Post*, 19 Jun 2015.

National Vital Statistics (2009). Deaths: Final Data for 2009. National Vital Statistics Systems.

Nawata, K. & Nagase, N. (1996). Estimation of sample selection bias models. *Econometric Reviews,* 15, 387-400.

Naylor, R. W., Droms, C. M. & Haws, K. L. (2009). Eating with a purpose: Consumer response to functional food health claims in conflicting versus complementary information environments. *Journal of Public Policy & Marketing,* 28, 221-233.

Nejad, L. M., Wertheim, E. H. & Greenwood, K. (2005). Comparison of the health belief model and the theory of planned behavior in the prediction of dieting and fasting behavior. *Sensoria: A Journal of Mind, Brain & Culture,* 1, 63-74.

Nejad, L. M., Wertheim, E. H. & Greenwood, K. M. (2004). Predicting dieting behavior by using, modifying, and extending the theory of planned behavior. *Journal of Applied Social Psychology,* 34, 2099-2131.

Neumark-Sztainer, D., Paxton, S. J., Hannan, P. J., Haines, J. & Story, M. (2006). Does body satisfaction matter? Five-year longitudinal associations between body satisfaction and health behaviors in adolescent females and males. *Journal of Adolescent Health,* 39, 244-251.

Newham, J. J., Allan, C., Leahy-Warren, P., Carrick-Sen, D. & Alderdice, F. (2016). Intentions Toward Physical Activity and Resting Behavior in Pregnant Women: Using the Theory of Planned Behavior Framework in a Cross-Sectional Study. *Birth,* 43, 49-57.

Newman, C., Henchion, M. & Matthews, A. (2003). A double-hurdle model of Irish household expenditure on prepared meals. *Applied Economics,* 35, 1053-1061.

Nocella, G., Hubbard, L. & Scarpa, R. (2010). Farm animal welfare, consumer willingness to pay, and trust: Results of a cross-national survey. *Applied Economic Perspectives and Policy,* 32, 275-297.

Norman, P. (2011). The theory of planned behavior and binge drinking among undergraduate students: Assessing the impact of habit strength. *Addictive Behaviors,* 36, 502-507.

Norris, P. E. & Batie, S. S. (1987). Virginia farmers' soil conservation decisions: An application of Tobit analysis. *Southern Journal of Agricultural Economics,* 19, 79-90.

O'connor, P. J., Martin, B., Weeks, C. S. & Ong, L. (2014). Factors that influence young people's mental health help-seeking behaviour: a study based on the Health Belief Model. *Journal of Advanced Nursing,* 70, 2577-2587.

OECD (2017). Obesity Update 2017.

Olsson, U. H., Foss, T., Troye, S. V. & Howell, R. D. (2000). The performance of ML, GLS, and WLS estimation in structural equation modeling under conditions of misspecification and nonnormality. *Structural Equation Modeling,* 7, 557-595.

Open Reporters. (2016). "Across Country, around World, Thais 'Bike for Dad'." *Bangkok Post*, 11 Dec 2015.

Paul, J., Modi, A. & Patel, J. (2016). Predicting green product consumption using theory of planned behavior and reasoned action. *Journal of Retailing and Consumer Services,* 29, 123-134.

Philipson, T. J. & Posner, R. A. (2003). The long-run growth in obesity as a function of technological change. *Prospectives in Biology and Medicine,* 46(3).

Picone, G., Sloan, F. & Taylor, D. (2004). Effects of risk and time preference and expected longevity on demand for medical tests. *Journal of Risk and Uncertainty,* 28, 39-53.

Pingitore, R., Spring, B. & Garfieldt, D. (1997). Gender differences in body satisfaction. *Obesity Research,* 5, 402-409.

Pitayatienanan, P., Butchon, R., Yothasamut, J., Aekplakorn, W., Teerawattananon, Y., Suksomboon, N. & Thavorncharoensap, M. (2014). Economic costs of obesity

in Thailand: a retrospective cost-of-illness study. *BMC Health Services Research,* 14, 146.

Pittayarangsalitta, S. (2016). NCDs: Kick off to the Goals. Bangkok: Ministry of Public Health.

Poínhos, R., van der Lans, I. A., Rankin, A., Fischer, A. R., Bunting, B., Kuznesof, S., Stewart-Knox, B. & Frewer, L. J. (2014). Psychological determinants of consumer acceptance of personalised nutrition in 9 European countries. *PloS one,* 9, e110614.

Pouta, E. (2004). Attitude and belief questions as a source of context effect in a contingent valuation survey. *Journal of Economic Psychology,* 25, 229-242.

Pouta, E., Rekola, M., Kuuluvainen, J., Tahvonen, O. & Li, C.-Z. (2000). Contingent valuation of the Natura 2000 nature conservation programme in Finland. *Forestry,* 73, 119-128.

Pouta, M. & Rekola, E. (2001). The theory of planned behavior in predicting willingness to pay for abatement of forest regeneration. *Society & Natural Resources,* 14, 93-106.

Prabawanti, C., Dijkstra, A., Riono, P. & Hartana, G. (2015). A survey on HIV-related health-seeking behaviors among transgender individuals in Jakarta, based on the theory of planned behavior. *BMC Public Health,* 15, 1138.

Provencher, V., Bégin, C., Gagnon-Girouard, M., Gagnon, H., Tremblay, A., Boivin, S. & Lemieux, S. (2007). Defined weight expectations in overweight women: anthropometrical, psychological and eating behavioral correlates. *International Journal of Obesity,* 31, 1731-1738.

Puhl, R. M. & Heuer, C. A. (2009). The stigma of obesity: a review and update. *Obesity,* 17, 941-964.

Raphael, D. (2011). A discourse analysis of the social determinants of health. *Critical Public Health,* 21, 221-236.

Rhodes, R. E. & Bruijn, G. J. (2013). How big is the physical activity intention–behaviour gap? A meta-analysis using the action control framework. *British Journal of Health Psychology,* 18, 296-309.

Riebl, S. K., MacDougal, C., Hill, C., Estabrooks, P. A., Dunsmore, J. C., Savla, J., Frisard, M. I., Dietrich, A. M. & Davy, B. M. (2016). Beverage choices of adolescents and their parents using the theory of planned behavior: a mixed methods analysis. *Journal of the Academy of Nutrition and Dietetics,* 116, 226-239. e1.

Romero, M. & Biswas, D. (2016). Healthy-Left, Unhealthy-Right: Can Displaying Healthy Items to the Left (versus Right) of Unhealthy Items Nudge Healthier Choices? *Journal of Consumer Research*, ucw008.

Rosenberger, R. S., Needham, M. D., Morzillo, A. T. & Moehrke, C. (2012). Attitudes, willingness to pay, and stated values for recreation use fees at an urban proximate forest. *Journal of Forest Economics,* 18, 271-281.

Rossi, I. A., Rousson, V., Viswanathan, B. & Bovet, P. (2011). Gender and socioeconomic disparities in BMI trajectories in the Seychelles: a cohort analysis based on serial population-based surveys. *BMC Public Health,* 11, 912.

Rothblum, E. D., Brand, P. A., Miller, C. T. & Oetjen, H. A. (1990). The relationship between obesity, employment discrimination, and employment-related victimization. *Journal of Vocational Behavior,* 37, 251-266.

Rothman, A. J. (2000). Toward a theory-based analysis of behavioral maintenance. *Health Psychology,* 19, 64.

Ruckert, A. & Labonté, R. (2014). The Social Determinants of Health. *The Handbook of Global Health Policy*, 267-285.

Ruggeri, M. & Van Der Pol, M. (2012). Is risk attitude really specific within the health context domain? Further evidence from an Italian survey using probability equivalent technique and face-to-face interviews. *Health, Risk & Society,* 14, 655-666.

Ruhm, C. J. (2012). Understanding overeating and obesity. *Journal of Health Economics,* 31, 781-796.

Ryan, A. M. & Spash, C. L. (2011). Is WTP an attitudinal measure? Empirical analysis of the psychological explanation for contingent values. *Journal of Economic Psychology,* 32, 674-687.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist,* 55, 68.

Rydén, A., Sullivan, M., Torgerson, J. S., Karlsson, J., Lindroos, A. K. & Taft, C. (2003). Severe obesity and personality: a comparative controlled study of personality traits. *International Journal of Obesity,* 27, 1534-1540.

Sabater-Grande, G. & Georgantzis, N. (2002). Accounting for risk aversion in repeated prisoners' dilemma games: An experimental test. *Journal of Economic Behavior & Organization,* 48, 37-50.

San-Cristobal, R., Navas-Carretero, S., Celis-Morales, C., Brennan, L., Walsh, M., Lovegrove, J. A., Daniel, H., Saris, W. H., Traczyk, I. & Manios, Y. (2015). Analysis of Dietary Pattern Impact on Weight Status for Personalised Nutrition through On-Line Advice: The Food4Me Spanish Cohort. *Nutrients,* 7, 9523-9537.

Sawadmongkol, S. (2015). Annual Report 2015. Bangkok: Ministry of Public Health.

Sayruamyat, S., Nocella, G. & Georgantzis, N. (Year). Consumers' Acceptance of Personalised Nutrition Programme in Thailand: Impact of Attitudes, Risk and Time preferences on Trying and Willingness to Pay. *In:* The XV EAAE Congress: Towards Sustainable Agri-Food Systems: Balancing between Markets and Society, 28 August - 1 September 2017 Pama, Italy.

Scharff, R. L. (2009). Obesity and hyperbolic discounting: Evidence and implications. *Journal of Consumer Policy,* 32, 3-21.

Schmeiser, M. D. (2009). Expanding wallets and waistlines: the impact of family income on the BMI of women and men eligible for the Earned Income Tax Credit. *Health Economics,* 18, 1277-1294.

Sejwacz, D., Ajzen, I. & Fishbein, M. (1980). Predicting and understanding weight loss: Intentions, behaviors, and outcomes. *Understanding Attitudes and Predicting Social Behavior*, 101-112.

Sheeran, P. (2002). Intention—behavior relations: A conceptual and empirical review. *European Review of Social Psychology,* 12, 1-36.

Sheeran, P. & Orbell, S. (1998). Do intentions predict condom use? Metaanalysis and examination of six moderator variables. *British Journal of Social Psychology,* 37, 231-250.

Sheeran, P., Orbell, S. & Trafimow, D. (1999). Does the temporal stability of behavioral intentions moderate intention-behavior and past behavior-future behavior relations? *Personality and Social Psychology Bulletin,* 25, 724-734.

Sheldon, K. M. & Elliot, A. J. (1999). Goal striving, need satisfaction, and longitudinal well-being: the self-concordance model. *Journal of Personality and Social Psychology,* 76, 482.

Sheldon, K. M., Turban, D. B., Brown, K. G., Barrick, M. R. & Judge, T. A. (2003). Applying self-determination theory to organizational research. *Research in Personnel and Human Resources Management,* 22, 357-394.

Sheppard, B. H., Jon, H. & Warshaw, P. R. (1988). The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendations for Modifications and Future Research. *Journal of Consumer Research,* 15, 325-343.

Silva, M. N., Vieira, P. N., Coutinho, S. R., Minderico, C. S., Matos, M. G., Sardinha, L. B. & Teixeira, P. J. (2010). Using self-determination theory to promote physical activity and weight control: a randomized controlled trial in women. *Journal of Behavioral Medicine,* 33, 110-122.

Slessareva, E. & Muraven, M. (2004). Sensitivity to punishment and self-control: The mediating role of emotion. *Personality and Individual Differences,* 36, 307-319.

Sobal, J., Rauschenbach, B. S. & Frongillo, E. A. (1992). Marital status, fatness and obesity. *Social Science & Medicine,* 35, 915-923.

Sonneville, K. R., Calzo, J. P., Horton, N. J., Haines, J., Austin, S. B. & Field, A. E. (2012). Body satisfaction, weight gain and binge eating among overweight adolescent girls. *International Journal of Obesity,* 36, 944-949.

Sparks, P., Hedderley, D. & Shepherd, R. (1991). Expectancy-value models of attitudes: A note on the relationship between theory and methodology. *European Journal of Social Psychology,* 21, 261-271.

Spash, C. L. & Biel, A. (2002). Social psychology and economics in environmental research. *Journal of Economic Psychology,* 23, 551-555.

Spash, C. L., Urama, K., Burton, R., Kenyon, W., Shannon, P. & Hill, G. (2009). Motives behind willingness to pay for improving biodiversity in a water ecosystem: Economics, ethics and social psychology. *Ecological Economics,* 68, 955-964.

Stadler, G., Oettingen, G. & Gollwitzer, P. M. (2010). Intervention effects of information and self-regulation on eating fruits and vegetables over two years. *Health Psychology,* 29, 274.

Steer, T. (2016). *An update on adult obesity levels in the UK and the cost to the NHS*. URL: http://food.cieh.org/an_update_on_adult_obesity_levels_in_the_uk.html?RequestId=2a1d6f79 [11 August].

Stewart-Knox, B. J., Bunting, B. P., Gilpin, S., Parr, H. J., Pinhão, S., Strain, J., de Almeida, M. D. & Gibney, M. (2008). Attitudes toward genetic testing and personalised nutrition in a representative sample of European consumers. *British Journal of Nutrition,* 101, 982-989.

Stroebele, N. & de Castro, J. M. (2004). Television viewing is associated with an increase in meal frequency in humans. *Appetite,* 42, 111-113.

Su, X., Li, L., Griffiths, S. M., Gao, Y., Lau, J. T. & Mo, P. K. (2015). Smoking behaviors and intentions among adolescents in rural China: the application of the Theory of Planned Behavior and the role of social influence. *Addictive Behaviors,* 48, 44-51.

Sullivan, S., Cloninger, C., Przybeck, T. & Klein, S. (2007). Personality characteristics in obesity and relationship with successful weight loss. *International Journal of Obesity,* 31, 669-674.

Sun, S. Z. & Empie, M. W. (2007). Lack of findings for the association between obesity risk and usual sugar-sweetened beverage consumption in adults – A primary analysis of databases of CSFII-1989–1991, CSFII-1994–1998, NHANES III,

and combined NHANES 1999–2002. *Food and Chemical Toxicology,* 45, 1523-1536.

Sutin, A. R. (2013). Optimism, pessimism and bias in self-reported body weight among older adults. *Obesity,* 21, E508-E511.

Sutin, A. R., Costa, P. T., Chan, W., Milaneschi, Y., Eaton, W. W., Zonderman, A. B., Ferrucci, L. & Terracciano, A. (2013). I Know Not To, but I Can't Help It Weight Gain and Changes in Impulsivity-Related Personality Traits. *Psychological Science,* 24, 1323-1328.

Sutin, A. R., Ferrucci, L., Zonderman, A. B. & Terracciano, A. (2011). Personality and obesity across the adult life span. *Journal of Personality and Social Psychology,* 101, 579.

Sutin, A. R., Rogers, D. L., Mercado, A., Weimer, A., Rodriguez, C. C., Gonzalez, M., Robins, R. W., Schwartz, S. J. & Terracciano, A. (2015a). The association between personality traits and body mass index varies with nativity among individuals of Mexican origin. *Appetite,* 90, 74-79.

Sutin, A. R., Stephan, Y., Wang, L., Gao, S., Wang, P. & Terracciano, A. (2015b). Personality traits and body mass index in Asian populations. *Journal of Research in Personality,* 58, 137-142.

Sutin, A. R. & Terracciano, A. (2015). Personality traits and body mass index: Modifiers and mechanisms. *Psychology & health*, 1-17.

Sutin, A. R. & Terracciano, A. (2017). Personality and Body Weight. *The Japanese Journal of Personality,* 26, 1-11.

Sutter, M., Kocher, M. G., Rützler, D. & Trautmann, S. (2013). Impatience and uncertainty: Experimental decisions predict adolescents' field behavior. *American Economic Review,* 103, 21.

Sutton, S. (1998). Predicting and explaining intentions and behavior: How well are we doing? *Journal of Applied Social Psychology,* 28, 1317-1338.

Sutton, S. (2004). Determinants of health-related behaviours: Theoretical and methodological issues. *The Sage handbook of health psychology. London: Sage*, 94-126.

Takada, A., Nakamura, R., Furukawa, M., Takahashi, Y., Nishimura, S. & Kosugi, S. (2011). The relationship between weight loss and time and risk preference parameters: a randomized controlled trial. *Journal of Biosocial Science,* 43, 481-503.

Tarkiainen, A. & Sundqvist, S. (2005). Subjective norms, attitudes and intentions of Finnish consumers in buying organic food. *British food journal,* 107, 808-822.

Teachman, J. (2016). Body weight, marital status, and changes in marital status. *Journal of Family Issues,* 37, 74-96.

Thumrungsi, T. e. a. (2014). *The Report of NCDs Situation, Health and Social crisis.* 1 ed. Bangkok: Thai NCD Network.

Tomasone, J. R., Meikle, N. & Bray, S. R. (2015). Intentions and trait self-control predict fruit and vegetable consumption during the transition to first-year university. *Journal of American College Health,* 63, 172-179.

Torrubia, R., Avila, C., Moltó, J. & Caseras, X. (2001). The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) as a measure of Gray's anxiety and impulsivity dimensions. *Personality and Individual Differences,* 31, 837-862.

Trafimow, D. & Finlay, K. A. (1996). The importance of subjective norms for a minority of people: Between subjects and within-subjects analyses. *Personality and Social Psychology Bulletin,* 22, 820-828.

Tyrrell, J., Wood, A. R., Ames, R. M., Yaghootkar, H., Beaumont, R. N., Jones, S. E., Tuke, M. A., Ruth, K. S., Freathy, R. M. & Smith, G. D. (2017). Gene–obesogenic environment interactions in the UK Biobank study. *International Journal of Epidemiology*, dyw337.

Vartanian, L. R., Schwartz, M. B. & Brownell, K. D. (2007). Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *American Journal of Public Health,* 97, 667-675.

Vassallo, M., Saba, A., Arvola, A., Dean, M., Messina, F., Winkelmann, M., Claupein, E., Lähteenmäki, L. & Shepherd, R. (2009). Willingness to use functional breads. Applying the Health Belief Model across four European countries. *Appetite,* 52, 452-460.

Vassallo, M., Scalvedi, M. L. & Saba, A. (2016). Investigating psychosocial determinants in influencing sustainable food consumption in Italy. *International Journal of Consumer Studies,* 40, 422-434.

Vogel, T. & Wanke, M. (2016). *Attitudes and Attitude Change.* 2 ed. New York: Routledge.

Waitzman, E. (2015). Obesity Levels in England. House of Lords in Focus.

Warshawsky-Livne, L., A'Wad, F., Shkolnik-Inbar, J. & Pliskin, J. S. (2012). A note on the relationship between health-risk attitude and monetary-risk attitude. *Health, Risk & Society,* 14, 377-383.

Weber, E. U. (2010). Risk attitude and preference. *Wiley Interdisciplinary Reviews: Cognitive Science,* 1, 79-88.

Weller, R. E., Cook, E. W., Avsar, K. B. & Cox, J. E. (2008). Obese women show greater delay discounting than healthy-weight women. *Appetite,* 51, 563-569.

Werner, P., Schnaider-Beeri, M., Aharon, J. & Davidson, M. (2002). Family caregivers' willingness to pay for drugs indicated for the treatment of Alzheimer's disease: an economic or psychological model? *Dementia,* 1, 59-74.

WHO. (2015). *Noncommunicable diseases*. URL: http://www.who.int/mediacentre/factsheets/fs355/en/ [11 Febuary].

WHO. (2016). *Obesity and overweight : Fact sheet*. URL: http://www.who.int/mediacentre/factsheets/fs311/en/ [14 July 2016].

WHO expert consultation (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet,* 363, 157-163.

Williams, G. C., Grow, V. M., Freedman, Z. R., Ryan, R. M. & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. *Journal of Personality and Social Psychology,* 70, 115.

Williamson, D. F., Serdula, M. K., Anda, R. F., Levy, A. & Byers, T. (1992). Weight loss attempts in adults: goals, duration, and rate of weight loss. *American Journal of Public Health,* 82, 1251-1257.

Wilson, K. E. & Dishman, R. K. (2015). Personality and physical activity: A systematic review and meta-analysis. *Personality and Individual Differences,* 72, 230-242.

Wilson, S. E. (2012). Marriage, gender and obesity in later life. *Economics & Human Biology,* 10, 431-453.

Wilson, W. R. (1967). Correlates of avowed happiness. *Psychological bulletin,* 67, 294.

Wing, R. R. & Hill, J. O. (2001). Successful weight loss maintenance. *Annual Review of Nutrition,* 21, 323-341.

Wood, R. G., Goesling, B. & Avellar, S. (2007). The effects of marriage on health: A synthesis of recent research evidence. *Princeton, NJ: Mathematica Policy Research, Inc*.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data.* MIT press.

World Obesity Federation. (2017). *World Obesity Day*. [26].

Xie, C., Bagozzi, R. P. & Troye, S. V. (2008). Trying to prosume: toward a theory of consumers as co-creators of value. *Journal of the Academy of Marketing Science,* 36, 109-122.

Yazdanpanah, M. & Forouzani, M. (2015). Application of the Theory of Planned Behaviour to predict Iranian students' intention to purchase organic food. *Journal of Cleaner Production,* 107, 342-352.

Zhang, L. & Rashad, I. (2008). Obesity and time preference: the health consequences of discounting the future. *Journal of Biosocial Science,* 40, 97-113.

Zhang, Q. & Wang, Y. (2004). Socioeconomic inequality of obesity in the United States: do gender, age, and ethnicity matter? *Social Science & Medicine,* 58, 1171-1180.

Zimmermann, F. & Sieverding, M. (2010). Young adults' social drinking as explained by an augmented theory of planned behaviour: The roles of prototypes, willingness, and gender. *British Journal of Health Psychology,* 15, 561-581.

Zoellner, J., Krzeski, E., Harden, S., Cook, E., Allen, K. & Estabrooks, P. A. (2012). Qualitative application of the theory of planned behavior to understand beverage consumption behaviors among adults. *Journal of the Academy of Nutrition and Dietetics,* 112, 1774-1784.

Zuckerman, M. (1979). *Sensation seeking : beyond the optimal level of arousal.* New York: Lawrence Erlbaum Associates.

Zuckerman, M. (2007). The sensation seeking scale V (SSS-V): Still reliable and valid. *Personality and Individual Differences,* 43, 1303-1305.

Appendix A Questionnaires

Appendix A.1 Questionnaire for phase 1

Reference No.

Information sheet

As part of my PhD at the University of Reading, I am currently conducting a research project to evaluate the impact of attitudes and personality traits on weight goals and WTP for a Personalised Nutrition Programme in Thailand, supervised by Dr. Giuseppe Nocella. To undertake this research, we are currently contacting participants in Bangkok, Thailand, willing to take part in a survey. We would like to invite you to participate in this survey which takes approximately 20 minutes. You can read the whole questionnaire and decide to or not to participate this research project. You are free to withdraw from the survey at any time if you feel uncomfortable or unwilling to participate, and you do not have to specify a reason. Any contribution can be withdrawn at any stage and removed from the research if desired within 30 days after interviewing date. If you wish to withdraw, please contact Suwanna Sayruamyat or Dr. Giuseppe Nocella (details below), quoting the reference at the top of this page. Your information will be treated anonymously and the result will be reported only in aggregated form. These details will be deleted by 30 September 2017. If you would like to know a summary of the research results, you can contact us (details below).

If at any stage you wish to receive further information about the questionnaire and research project, please do not hesitate to contact us (details below). The findings will be published in an international journal and this will not affect your anonymity. Please contact the supervisor if you would like to receive an electronic copy of this article once published. All data will be stored securely either electronically on a password-protected computer or in hard copy version in a locked cupboard. The data will be destroyed at the end of the research project within 30 days.

If you are affected or require any more information on these topics, regarding drinking, smoking, weight control etc., then please refer to Kasetsart University Service, or your preferred hospital.

By completing this survey, you are acknowledging that you understand the terms and participation and that you consent to these terms. This research project has been reviewed according to the procedures specified by the University Research Ethics committee and has been given a favourable ethical opinion for conduct.

Thank you very much for taking time to take part in this survey.

Suwanna Sayruamyat

Department of Agricultural and Food Economics

School of Agriculture, Policy and Development l University of Reading l Reading, RG6 6AR

Email: s.sayruamyat@pgr.reading.ac.uk

Supervisor: Dr Giuseppe Nocella

Programme Director of MSc Food Economics and Marketing

School of Agriculture, Policy and Development l University of Reading l Reading, RG6 6AR

E-Mail: g.nocella@reading.ac.uk

.....Participant part.....

I have received a copy of this consent form:

Name (In block capital): .....

Date: .....

Signature: .....

Interview Protocol

Participant Recruitment

Researchers contact and make appointment with participants listed from the previous survey who have made agreement to participate in this second data collection. Participants will be arranged for interview at the office of Center for Applied Economics Research, Kasetsart University, Thailand.

The participants will be offered incentive (THB150). The volunteered participants will be invited for interview at the office of Center for Applied Economics Research, Kasetsart University, Thailand.

Interview Procedure

The interviewers (the same as the phase1) are assistant researchers working at the Center for Applied Economics Research, Kasetsart University, Thailand. The interviewers will be trained to interview participants according to the interview protocol under the supervision of the main researcher. In this phase, there will be 2 roles of interviewers. The first interviewer will be responsible for registration and assigning the reference number for the survey using information from the previous survey. The second interviewer will be responsible for facilitating participants to answer the survey without knowing participant identity. The procedure will be applied to ensure data integrity and anonymity of the participants.

The interviewers must to follow the interview protocol:

The first interviewer at the registration desk read the information sheet and then ask participants to sign the consent form in the bottom of the information sheet.

The first interviewer fills the reference number in the information sheet and also in the questionnaire.

The participant goes to the interview room, which is separate from the registration area.

The second interviewer (different person from the one at the registration desk) asks the participants to fill all questions of part 1-5 on their own.

The second interviewer checks through the whole questionnaire to confirm that all parts have been completed by the participant. Next the interview will separate the consent form from the questionnaire.

The second interviewer informs the participant that the participant may have a choice to change their mind to withdraw himself/herself from the project, he/she must contact the main researcher the within 30 days after interviewing date to withdraw his/her data from the survey.

The second interviewer will pay the incentive (THB 150) to participants and then ask the participants to sign the name in the form of payment.

The first interviewer will collect all the consent forms and deliver to the main researcher for reference.

The second interviewer will collect the whole set of questionnaire anonymously and deliver to the assistant researcher to input the data into the excel file.

In summary, the information in the questionnaire will be collected separately from the consent form. This will ensure anonymous of the information as there is only the reference number assigned in the questionnaire. The assistant researcher will entry data into the excel file anonymously.

Right of Participants,

The interviewers will not force the participant to answer the questionnaire.

Participants are free to withdraw from the survey at any time if they feel uncomfortable or unwilling to participate, and they do not have to specify their reasons.

Relevant Information

If any of participants would like to inquire any further information on these topics relating to their personal health condition, they will be referred to Kasetsart University Service* or their own preferred hospital.

Note: *Infirmary of Kasetsart University

50 Ngamwongwan Ladyao Chatuchak Bangkok 10900 THAILAND

Tel.(Public) +66-2579-0030, +66-2940-6630-1

Tel.(Local KU) +66-2942-8200 Ext 1278,1281-2,1138-9

E-mail: infirmary @ ku.ac.th

WEB: www.inf.ku.ac.th

Reference No. _____

Start _____ End_____

Interviewer _____

The first survey (phase 1)

We would ask you some questions regarding general aspect of your life.

This research will survey again in next 6 months to follow up your weight. Are you willing to participate in the second phase of this research project in the next 6 months?

(_1_) Yes (_0_) No

We would ask you some questions regarding your health information.

Health information

H1. Height: _____ cm.

H2. Weight: _____ Kg.

H3. Do you have any medical problems following disease lists?

(_1_) Yes (_1_) Blood pressure (_2_) Cholesterol

(_3_) Heart disease/cardiovascular disease (_4_) Stroke

(_5_) Cancer (_6_) diabetes

(_7_) Others _____

(_0_) No

H4. How many days per week do you exercise at least 30 minutes mod? _____ Days

H5. How many days per week do you exercise at least 30 minutes vigorous?_____ Days

H6. Do you have any life or health insurance? (Apart from social insurance)

(_1_) Yes (_0_) No

H7. Do you smoke?

(_1_) Yes (_1_) I smoke daily approximately _____ cigarettes a day

(_2_) I smoke occasionally but not every day

(_3_) I used to smoke daily but do not smoke at all now

(_4_) I used to smoke occasionally but do not smoke at all now

(_0_) No, I do not smoke at all

H8. How often had an alcoholic drink?

(_1_) Yes (_1_) Almost every day (_2_) 5 – 6 days a week

(_3_) 3 – 4 days a week (_4_) Once or twice a week

(_5_) Once or twice a month (_6_) Once every couple of months

(_7_) Once or twice a year

(_0_) No, I do not drink alcohol at all

H9. How many glasses of alcoholic drink a day do you drink? _____ Glasses/Bottles

Goal setting

C1. Thinking of your eating habits, what goal would you like to trying to achieve in the next 6 months?

(_1_) To stay about the same weight
(_2_) To lose weight
(_3_) To gain weight

C2. Considering your current weight, how much weight would you like to lose or gain?

____ kg.

C3. Considering what you have stated on the previous questions (C1 – C3), we would like to know your opinion on the following statements on a scale ranging from strongly disagree to strongly agree. Please write a number next to each statement to indicate the extent to which **you agree or disagree with that statement.**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

_____ 1. It's hard to take this goal seriously.
_____ 2. It's unrealistic for me to expect to reach this goal.
_____ 3. It is quite likely that this goal may need to be revised, depending on how things go.
_____ 4. Quite frankly, I don't care if I achieve this goal or not.
_____ 5. I am strongly committed to pursuing this goal.
_____ 6. It wouldn't take much to make me abandon this goal.
_____ 7. I think this is a good goal to shoot for.
_____ 8. I am willing to put forth a great deal of effort beyond what I'd normally do to achieve this goal.
_____ 9. There is not much to be gained by trying to achieve this goal.

Scenario of personalised nutrition service

Imagine that a new service will be available on the market to help you to achieve your weight goal. The new service is offered by a pool of experts (GP, nutritionist and psychologists) who will personalise your diet taking into account aspects of your genes, personality, health status, body mass index, phenotype and your current diet. This is what expert call personalised nutrition.

Personalised nutrition will help you to follow a diet, which as well as helping you to achieve your stated weight goal will also help you to minimise risk of diseases related to obesity and

overweight such as diabetes, heart disease and cancer. This service includes four stages (show card):

1. A doctor will collect information about your health status, physical activity, BMI, and dietary habits including food intolerances and allergies.
2. You will be offered a genetic blood test (nutrigenomic test) to understand the basis of your genes and what type of food you should consume to reduce the risk of developing obesity related diseases mentioned before.
3. The results of your nutrigenomic test will be discussed together with a GP, nutritionist and psychologist to prepare a list of foods, menus and recommendations that you have to follow to achieve your goal.
4. After this initial stage, you are required to visit the centre every two weeks. During these visits, you will be monitored in terms of progress towards the achievement of your stated weight goal and discuss your personal situation with a nutritionist and a psychologist.

The personalised nutrition service described above is not free and let's assume that it is available to you next week. What is your intention to try the personalised nutrition service?

(_1_) I strongly intend to try the personalised nutrition service
(_2_) I intend to try the personalised nutrition service
(_3_) I do not intend to try the personalised nutrition service
(_4_) I do not intend at all to try the personalised nutrition service

Please can you tell as why you do not intend to try this service:

(_1_) I do not want to gain or lose weight;
(_2_) I do not believe in this service;
(_3_) I cannot afford it;
(_4_) I pay taxes and thus this service should be free for all citizens;
(_5_) I can do it by myself, this service is not necessary for me;
(_6_) Other (Please specify): _____

Personalised Nutrition Programme

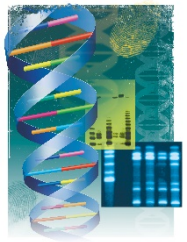
People truly commit to lose weight/ maintain weight/gain weight

Seeking advice to achieve your goal

Meeting a doctor/ specialist

1st step

Initial diagnostic information



Nutrigenomic test (Genetic blood test)

2nd step

Discussing nutrigenomics results with your doctor

Recommendation to follow a customized diet to counteract obesity and related diseases

3rd step

Dietician/ specialist

Dietary recommendations

Menu plan

Tips for recipes, food choices and shopping lists

Applying dietary plan and self-monitoring

4th step

Doctor

Dietician/specialist

Reviewing and revision dietary plan twice a month

6 months outcomes

Achieving your weight desire and decreasing the risk of getting obesity related diseases

However, the personalised nutrition service described above is not available on the market yet and we would like to know whether you are willing to pay for trying this service. Please look at the monetary values in ฿ per month shown in the tables below both for entering a personalised nutrition programme that lasts six months and a personalised nutrition programme that last one year. Indicate the **maximum amount of money per month** that you are willing to pay for this service, but remember that your budget is limited and so spending money for a personalised nutrition service, you will have less money to buy other goods and/or services.

Monthly WTP for 6 months		Monthly WTP for 1 year	
(…)	฿ 0	(…)	฿ 0
(…)	฿ 834	(…)	฿ 834
(…)	฿ 1,000	(…)	฿ 1,000
(…)	฿ 1,500	(…)	฿ 1,500
(…)	฿ 1,667	(…)	฿ 1,667
(…)	฿ 2,000	(…)	฿ 1,834
(…)	฿ 2,500	(…)	฿ 2,000
(…)	฿ 2,584	(…)	฿ 2,125
(…)	฿ 2,667	(…)	฿ 2,167
(…)	฿ 2,750	(…)	฿ 2,208
(…)	฿ 2,834	(…)	฿ 2,250
(…)	฿ 2,917	(…)	฿ 2,292
(…)	฿ 3,000	(…)	฿ 2,334
(…)	฿ 3,084	(…)	฿ 2,375
(…)	฿ 3,167	(…)	฿ 2,417
(…)	฿ 3,250	(…)	฿ 2,459
(…)	฿ 3,334	(…)	฿ 2,500
(…)	฿ 3,417	(…)	฿ 2,542
(…)	฿ 3,500	(…)	฿ 2,584
(…)	฿ 3,584	(…)	฿ 2,625
(…)	฿ 3,667	(…)	฿ 2,667
(…)	฿ 3,750	(…)	฿ 2,709
(…)	฿ 3,834	(…)	฿ 2,750
(…)	฿ 3,917	(…)	฿ 2,792
(…)	฿ 4,000	(…)	฿ 2,834
(…)	฿ 4,084	(…)	฿ 2,875
(…)	฿ 4,167	(…)	฿ 2,917
(…)	฿ 4,250	(…)	฿ 2,959
(…)	฿ 4,334	(…)	฿ 3,000
(…)	฿ 4,417	(…)	฿ 3,042
(…)	฿ 4,500	(…)	฿ 3,084
(…)	฿ 4,584	(…)	฿ 3,125
(…)	฿ 4,667	(…)	฿ 3,167
(…)	฿ 4,750	(…)	฿ 3,209
(…)	฿ 4,834	(…)	฿ 3,250
(…)	฿ 4,917	(…)	฿ 3,292
(…)	฿ 5,000	(…)	฿ 3,334
(…)	More than ฿ 5,000 Please specify _____	(…)	More than ฿ 3,334 Please specify _____

Please look at the monetary values in ฿ shown in the tables below both for entering a personalised nutrition programme that lasts six months and a personalised nutrition programme that last one year. Indicate the **maximum amount of money** that you are willing to pay for this service, but remember that your budget is limited and so spending money for a personalised nutrition service, you will have less money to buy other goods and/or services.

	6 months
(…)	฿ 0
(…)	฿ 5,000
(…)	฿ 10,000
(…)	฿ 12,500
(…)	฿ 15,000
(…)	฿ 15,500
(…)	฿ 16,000
(…)	฿ 16,500
(…)	฿ 17,000
(…)	฿ 17,500
(…)	฿ 18,000
(…)	฿ 18,500
(…)	฿ 19,000
(…)	฿ 19,500
(…)	฿ 20,000
(…)	฿ 20,500
(…)	฿ 21,000
(…)	฿ 21,500
(…)	฿ 22,000
(…)	฿ 22,500
(…)	฿ 23,000
(…)	฿ 23,500
(…)	฿ 24,000
(…)	฿ 24,500
(…)	฿ 25,000
(…)	฿ 25,500
(…)	฿ 26,000
(…)	฿ 26,500
(…)	฿ 27,000
(…)	฿ 27,500
(…)	฿ 28,000
(…)	฿ 28,500
(…)	฿ 29,000
(…)	฿ 29,500
(…)	฿ 30,000
(…)	More than ฿30,000 Please specify _____

	1 year
(…)	฿ 0
(…)	฿ 10,000
(…)	฿ 20,000
(…)	฿ 22,500
(…)	฿ 25,000
(…)	฿ 25,500
(…)	฿ 26,000
(…)	฿ 26,500
(…)	฿ 27,000
(…)	฿ 27,500
(…)	฿ 28,000
(…)	฿ 28,500
(…)	฿ 29,000
(…)	฿ 29,500
(…)	฿ 30,000
(…)	฿ 30,500
(…)	฿ 31,000
(…)	฿ 31,500
(…)	฿ 32,000
(…)	฿ 32,500
(…)	฿ 33,000
(…)	฿ 33,500
(…)	฿ 34,000
(…)	฿ 34,500
(…)	฿ 35,000
(…)	฿ 35,500
(…)	฿ 36,000
(…)	฿ 36,500
(…)	฿ 37,000
(…)	฿ 37,500
(…)	฿ 38,000
(…)	฿ 38,500
(…)	฿ 39,000
(…)	฿ 39,500
(…)	฿ 40,000
(…)	More than ฿40,000 Please specify _____

The theory of trying and Resistance to eating temptations

The theory of trying

Situation	Score	1	2	3	4	5	6	7
A1. When people diet some succeed and some fail. If following the personalised nutrition service you experienced **success** in achieving your weight goal during the next six months, how would this make you feel?		Extremely unpleasant	Very unpleasant	Unpleasant	Neither unpleasant nor pleasant	Pleasant	Very pleasant	Extremely pleasant
		Extremely bad	Very bad	Negative	Neither bad nor good	good	Very good	Extremely good
A2. Suppose you followed the personalised nutrition service during the next six months **but did not succeed**. How would this make you feel?		Extremely unpleasant	Very unpleasant	Unpleasant	Neither unpleasant nor pleasant	Pleasant	Very pleasant	Extremely pleasant
		Extremely bad	Very bad	Negative	Neither bad nor good	good	Very good	Extremely good
A3. If you were following the personalised nutrition service during the next six months, **how would you describe the experience**?		Extremely unenjoyable	Very Unenjoyable	Unenjoyable	Neither unenjoyable nor enjoyable	enjoyable	Very enjoyable	Extremely enjoyable
		Extremely bad	Very bad	Negative	Neither bad nor good	good	Very good	Extremely good
A4. Most **people** who are important to you express approval or disapproval of your activities. Please tell us whether these people would approve or disapprove if you follow the personalised nutrition service during the next six months.		Totally disapprove	Strongly disapprove	Disapprove	Neither disapprove nor approve	Approve	Strongly approve	Completely approve
A5. Assuming I try to follow the personalised nutrition service during the next six months, it is likely/unlikely that I actually **would achieve** my goal.		Extremely unlikely	Very unlikely	Unlikely	Neither unlikely nor likely	Likely	Very likely	Extremely likely
A6. Assuming I try to following the personalised nutrition service during the next six months, it is likely/unlikely that I **would fail** to achieve my goal.		Extremely unlikely	Very unlikely	Unlikely	Neither unlikely nor likely	Likely	Very likely	Extremely likely
A9. During **the past year** I tried to achieve one of these actions--to lose weight, to maintain weight, or to gain weight.	_____ 1 = not at all _____ 2 = once _____ 3 = a couple of times _____ 4 = several times _____ 5 = many times _____ 6 = very many times							
A10. During **the last month** I tried to achieve one of these action--to lose weight, to maintain weight, or to gain weight.	_____ 1 = not at all _____ 2 = once _____ 3 = a couple of times _____ 4 = several times _____ 5 = many times _____ 6 = very many times							

Resistance to eating temptations

Please rate the score that how much you can resist to eating from 1 - 4 (1 = Strongly disagree, 2 = Disagree, 3 = Agree and 4 = Strongly Agree) with each situation.

I can resist eating …	**1=Strongly disagree** **2= Disagree** **3=Agree** **4= Strongly agree**
1. When there are many different kinds of food available.	
2. Even when high calorie foods are available. (my favourite foods)	
3. When I am at a party.	
4. Even when I have to say “no” to other.	
5. Even when others are pressuring me to eat.	
6. Even when I feel it’s impolite to refuse a second helping.	
7. When I am happy.	
8. When I am depressed.	
9. When I have experienced failure.	
10. Just before going to bed.	
11. At buffet (all you can eat) restaurants.	
12. When I am reading.	
13. When I go out shopping.	
14. More than usual around holidays	

Risk attitudes and time preferences

Risk attitudes

R1. Do you purchase the lottery tickets? (_1_) Yes (_0_) No

R2. From Q1 if yes how much do you spend to lottery tickets per month? _____ Baht

R3. Each one of the following four "panels" shows you 10 lotteries including a possibility to earn 100 Baht for sure. Each lottery has a probability of winning a prize otherwise nothing. The prize is the amount of Baht shown below the winning probability. **If you do not win the lottery, you earn 0 Baht**. Remember that you have to choose one lottery in each one of the four panels. Mark with an **X** the space corresponding to your choice.

Panel 1

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	111	125	143	167	200	250	333	500	1,000
Choice										

Panel 2

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	122	150	186	233	300	400	567	900	1,900
Choice										

Panel 3

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	167	250	357	500	700	1,000	1,500	2,500	5,500
Choice										

Panel 4

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	222	375	571	833	1,200	1,750	2,667	4,500	10,000
Choice										

Time preference

T1. Which option would you prefer between receiving 10,000 Baht **now** (choice A) and Receiving the money **one year later** and get the return (choice B)? Please indicate your option by selecting the 10 choices giving below:

A. Today	B. Next year	Choice
10,000	11,000	A B
10,000	12,000	A B
10,000	13,000	A B
10,000	14,000	A B
10,000	15,000	A B
10,000	16,000	A B
10,000	17,000	A B
10,000	18,000	A B
10,000	19,000	A B
10,000	20,000	A B

T2. If you would prefer 10,000 Baht today for all situations above (T1), how much would you prefer for one year later instead 10,000 now? ฿_____

T3. Which option would you prefer between receiving 10,000 Baht **next year** (choice A) and Receiving the money **2 years later** and get the return (choice B)? Please indicate your option by selecting the 10 choices giving below:

A. Next year	B. Next 2 years	Choice
10,000	11,000	A B
10,000	12,000	A B
10,000	13,000	A B
10,000	14,000	A B
10,000	15,000	A B
10,000	16,000	A B
10,000	17,000	A B
10,000	18,000	A B
10,000	19,000	A B
10,000	20,000	A B

T4. Suppose you earned a bonus ฿50,000. You then had a choice between getting the money now or invest in your company fund for one year. How much rate return would the fund have to pay you in order for you to agree to invest the money with your company?

(_1_) Take the money now

(_2_) Invest in fund and the return rate would be ____%

Satisfaction section

Please evaluate your satisfaction by using scale from 1 – 10 (totally dissatisfied to totally satisfied) follow:

S1. Overall how satisfied you are with your **life**? _____

S2. Overall how satisfied you are with your **diet**? _____

S3. Overall how satisfied you are with your **health**? _____

S4. Overall how satisfied you are with your **body shape**? _____

Sensitivity to Punishment and Sensitivity to Reward Questionnaire

Answer each question by circling "Yes" or "No" after each one. There are no right or wrong answers, or trick questions. Work quickly and don't think too much about the exact meaning of the question.

1.	Do you often refrain from doing something because you are afraid of it being illegal?	Yes	No
2.	Does the good prospect of obtaining money motivate you strongly to do some things?	Yes	No
3.	Do you prefer not to ask for something when you are not sure you will obtain it?	Yes	No
4.	Are you frequently encouraged to act by the possibility of being valued in you work, in your studies, with your friends or with your family?	Yes	No
5.	Are you often afraid of new or unexpected situations?	Yes	No
6.	Do you often meet people that you find physically attractive?	Yes	No
7.	Is it difficult for you to telephone someone you do not know?	Yes	No
8.	Do you like to take some drugs because of the pleasure you get from them?	Yes	No
9.	Do you often renounce you rights when you know you can avoid a quarrel with a person or an organization?	Yes	No
10.	Do you often do things to be praised?	Yes	No
11.	As a child were you troubled by punishments at home or in school?	Yes	No
12.	Do you like being the centre of attention at a party or a social meeting?	Yes	No
13.	In tasks that you are not prepared for, do you attach great importance to the possibility of failure?	Yes	No
14.	Do you spend a lot of your time on obtaining a good image?	Yes	No
15.	Are you easily discouraged in difficult situations?	Yes	No
16.	Do you need people to show their affection for you all the time?	Yes	No
17.	Are you a shy person?	Yes	No
18.	When you are with a group, do you try to make your opinions the most intelligent or the funniest?	Yes	No
19.	Whenever possible, do you avoid demonstrating your skills for fear of being embarrassed?	Yes	No
20.	Do you often take the opportunity to pick up people you find attractive?	Yes	No
21.	When you are with a group, do you have difficulties selecting a good topic to talk about?	Yes	No
22.	As a child, did you do a lot of things to get people's approval?	Yes	No
23.	Is it often difficult for you to fall asleep when you think about things you have done or must do?	Yes	No
24.	Does the possibility of social advancement, move you to action, even if this involves not playing fair?	Yes	No
25.	Do you think a lot before complaining in a restaurant if your meal is not well prepared?	Yes	No
26.	Do you generally give preference to those activities that imply an immediate gain?	Yes	No
27.	Would you be bothered if you had to return to a store when you noticed you were given the wrong change?	Yes	No
28.	Do you often have trouble resisting the temptation of doing forbidden things?	Yes	No
29.	Whenever you can, do you avoid going to unknown places?	Yes	No
30.	Do you like to compete and do everything you can do to win?	Yes	No
31.	Are you often worried by things you said or did?	Yes	No
32.	Is it easy for you to associate tastes and smells to very pleasant events?	Yes	No
33.	Would it be difficult for you to ask your boss for a raise (salary increase)?	Yes	No
34.	Are there a large number of objects or sensations that remind you of pleasant events?	Yes	No
35.	Do you generally avoid speaking in public?	Yes	No
36.	When you start to play with a slot machine, is it often difficult for you to stop?	Yes	No
37.	Do you, on a regular basis, think that you could do more things if it was not for your insecurity or fear?	Yes	No
38.	Do you sometimes do things for quick gains?	Yes	No
39.	Comparing yourself to people you know, are you afraid of many things?	Yes	No
40.	Does your attention easily stray from your work in the presence of an attractive stranger?	Yes	No
41.	Do you often find yourself worrying about things to the extent that performance in intellectual abilities is impaired?	Yes	No
42.	Are you interested in money to the point of being able to do risky jobs?	Yes	No
43.	Do you often refrain from doing something you like in order not to be rejected or disapproved by others?	Yes	No
44.	Do you like to put competitive ingredients in all of your activities?	Yes	No
45.	Generally, do you pay more attention to threats than to pleasant events?	Yes	No
46.	Would you like to be a socially powerful person?	Yes	No
47.	Do you often refrain from doing something because of your fear of being embarrassed?	Yes	No
48.	Do you like displaying your physical abilities even though this may involve danger?	Yes	No

Demographic information

D1. Name: _____ Nickname: _____

D2. Address: _____

D3. Gender: (_1_) Male (_2_) Female

D4. Birthday: DD / MM / YYYY

D5. Email: _____ Tel. _____

D6. Education: (_1_) Less than high school (_2_) High school or equivalent
(_3_) Bachelor degree (_4_) Master degree
(_5_) Doctoral degree or above

D7. Marital status: (_1_) Single, never married (_2_) Married or domestic partnership
(_3_) Widowed / Divorced / Separated

D8. Work place: _____

D9. Employment Status: (_1_) Self-employed (_2_) Employer
(_3_) Government employee (_4_) Private company employee
(_5_) Unemployed and looking for a job

D10. Monthly Income: (_1_) ≤10,000 Baht (_2_) 10,001 – 20,000 Baht
(_3_) 20,001 – 30,000 Baht (_4_) 30,001 – 40,000 Baht
(_5_) 40,001 – 50,000 Baht (_6_) 50,001 – 60,000 Baht
(_7_) 60,001 – 70,000 Baht (_8_) 70,001 – 80,000 Baht
(_9_) 80,001 – 90,000 Baht (_10_) 90,001 – 100,000 Baht
(_11_) ≥ 100,001 Baht

D11. How much your average food expenditure per month?_____ Baht.

D12. Debt status: (_1_) Yes(_2_) No

D13. Do you have any long term loan i.e. housing loan or car leasing?
(_1_) Yes (_0_) No

D14. Do you have any short term loan i.e. credit card installment or personal loan?
(_1_) Yes (_0_) No

D15. How long does it you from home to work? _____ Hrs.

D16. Between home and work, which is your transportation means?
(_1_) Public transport (_2_) Personal car/Motorbike
(_3_) Bicycle (_4_) Walking

D17. Who do you live with? (_1_) Family (_2_) Friend (_3_) alone

D18. Is one of your parent or your sibling overweight or obese?
(_1_) Yes (_1_) Father (_2_) Mother
(_3_) Brother (_4_) Sister
(_0_) No

D19. Are you willing to participate in the second phase of this research project in the next 6 months?
(_1_) Yes (_0_) No

D20. What goal would you like to trying to achieve in the next 6 months?
(_1_) To stay about the same weight
(_2_) To lose weight
(_3_) To gain weight

D21. According to your goal in the next 6 months, how much weight would you like to lose or gain? ____ kg.

เอกสารชี้แจง

งานวิจัยนี้เป็นส่วนหนึ่งของดุษฎีนิพนธ์เกี่ยวกับผลกระทบของทัศนคติและบุคลิกภาพที่มีต่อเป้าหมายการควบคุมน้ำหนักและความเต็มใจจ่ายเพื่อเข้ารับบริการโปรแกรม Personalised Nutrition ในประเทศไทย ภายใต้การควบคุมของ Dr. Giuseppe Nocella กลุ่มเป้าหมายของงานวิจัยนี้คือผู้ทำงานในเขตกรุงเทพมหานครในภาคส่วนต่างๆ โดยผู้วิจัยขอความร่วมมือในการตอบแบบสอบถามโดยใช้ระยะเวลาประมาณ 15 นาที

แบบสอบถามจำเป็นต้องถามข้อมูลส่วนตัวของท่านเพื่อใช้เป็นฐานข้อมูลในการสำรวจในปีถัดไป อย่างไรก็ตาม ผลของการวิจัยจะถูกรายงานในภาพรวม หากท่านต้องการทราบผลการวิจัย ท่านสามารถติดต่อผู้วิจัย (ตามรายละเอียดที่ระบุด้านล่าง) ท่านสามารถปฏิเสธการให้สัมภาษณ์ได้หากท่านรู้สึกว่าท่านไม่สะดวกหรือไม่ยินดีที่จะให้ข้อมูลในบางคำถาม หากท่านไม่ต้องการที่จะให้ข้อมูลของท่านเป็นส่วนหนึ่งในการวิเคราะห์ กรุณาติดต่อผู้วิจัย (ตามรายละเอียดที่ระบุด้านล่าง) ทั้งนี้เลขประจำแบบสอบถามของท่านตามที่ระบุด้านบนเป็นเพียงลำดับที่ของแบบสอบถามของท่านในการวิจัยครั้งนี้ซึ่งไม่ได้มีความเกี่ยวข้อใดๆกับข้อมูลของท่านที่ให้สัมภาษณ์ทั้งสิ้น

หากท่านมีข้อสงสัยเพิ่มเติมเกี่ยวกับแบบสอบถามหรืองานวิจัยนี้ กรุณาติดต่อผู้วิจัย (ตามรายละเอียดที่ระบุด้านล่าง) ผลการวิจัยครั้งนี้จะเผยแพร่ในวารสารนานาชาติซึ่งไม่มีผลกระทบต่อท่านใดๆ ทั้งสิ้น และข้อมูลที่ใช้ในการวิจัยครั้งนี้จะถูกทำลายเมื่อเสร็จสิ้นโครงการ

เมื่อท่านเสร็จสิ้นการให้สัมภาษณ์ ผู้วิจัยถือว่าท่านยินยอมว่า ท่านเข้าใจเงื่อนไขต่างๆ และอนุญาตใช้ข้อมูลของท่านเป็นส่วนหนึ่งของการวิจัยครั้งนี้ ทั้งนี้ กระบวนการในงานวิจัยครั้งนี้อยู่ภายใต้การควบคุมดูแลของ University Research Ethics committee ซึ่งได้รับการตรวจสอบแล้วว่า สามารถนำมาใช้รวบรวมข้อมูลโดยไม่ขัดต่อหลักจริยธรรม

ผู้วิจัยของขอบพระคุณท่านที่กรุณาให้ข้อมูลอันเป็นประโยชน์สำหรับการวิจัยครั้งนี้

สุวรรณา สายรวมญาติ

Department of Agricultural and Food Economics

School of Agriculture, Policy and Development l University of Reading l Reading, RG6 6AR

Email: s.sayruamyat@pgr.reading.ac.uk

อาจารย์ที่ปรึกษา Dr Giuseppe Nocella

Programme Director of MSc Food Economics and Marketing
Department of Agricultural and Food Economics

School of Agriculture, Policy and Development l University of Reading l Reading, RG6 6AR

E-Mail: g.nocella@reading.ac.uk

.....ส่วนสำหรับ ผู้ถูกสัมภาษณ์.....

ข้าพเจ้าได้อ่านข้อความข้างต้นแล้ว และมีความเข้าใจดีทุกประการ และได้ลงนามในใบยินยอม นี้ด้วยความเต็มใจ

ชื่อ-สกุล (ภาษาอังกฤษ): .....

วันที่: .....

ลายเซ็นต์: .....

No. _____

Date_____

Start _____ End_____

การสำรวจครั้งที่ 1 (ระยะที่ 1)

แบบสอบถามชุดนี้สำรวจข้อมูลมุมมองทั่วไปของท่าน ซึ่งงานวิจัยนี้มีการสำรวจข้อมูลระยะที่ 2 เพื่อติดตามผลการควบคุมน้ำหนักของท่านในอีก 6 เดือนข้างหน้า ท่านยินดีที่จะเข้าร่วมในการสำรวจข้อมูลระยะที่ 2 หรือไม่

(_1_) ยินดีเข้าร่วม (_0_) ไม่ยินดีเข้าร่วม

ข้อมูลเกี่ยวกับความชอบอาหารประเภทต่างๆ และข้อมูลสุขภาพ

คำถามส่วนนี้จะถามเกี่ยวกับ ข้อมูลด้านสุขภาพของท่าน

H1. ส่วนสูง: _____ เซนติเมตร

H2. น้ำหนัก: _____ กิโลกรัม

H3. ท่านมีโรคประจำตัวใดตามรายการด้านล่างนี้หรือไม่

(_1_) มี (_1_) ความดันโลหิต (_2_) คอเลสเตอรอล

(_3_) โรคหัวใจหลอดเลือดหัวใจ/ (_4_) เส้นเลือดในสมองแตกเฉียบพลัน

(_5_) มะเร็ง (_6_) เบาหวาน

(_7_) อื่นๆ (ระบุ)_____

(_0_) ไม่มี

H4. ท่านออกกำลังกายอย่างน้อย 30 นาทีแบบเบาๆ เช่น โยคะ วิ่งเหยาะๆ จำนวนกี่วันเฉลี่ยต่อสัปดาห์ _____ วัน

H5. ท่านออกกำลังกายอย่างน้อย 30 นาทีแบบจริงจัง (เช่น เล่นเทนนิส เดี่ยว, วิ่ง 10 กิโลเมตรขึ้นไป)

จำนวนกี่วันเฉลี่ยต่อสัปดาห์ _____ วัน

H6. ท่านมีประกันชีวิตหรือประกันสุขภาพหรือไม่ (ไม่รวมประกันสังคม) (_1_) มี (_0_) ไม่มี

H7. ท่านสูบบุหรี่หรือไม่

(_1_) สูบ (_1_) ฉันสูบทุกวันโดยเฉลี่ยนประมาณ _____ มวนต่อวัน

(_2_) ฉันสูบเป็นประจำแต่ไม่ได้สูบทุกวัน

(_3_) ฉันเคยสูบทุกวันแต่ปัจจุบันเลิกสูบแล้ว

(_4_) ฉันเคยสูบเป็นประจำแต่ปัจจุบันเลิกสูบแล้ว

(_0_) ไม่สูบ และไม่เคยสูบ

H8. ท่านดื่มเครื่องดื่มแอลกอฮอล์หรือไม่ ถ้าดื่มท่านดื่มบ่อยแค่ไหน

(_1_) ดื่ม (_1_) ดื่มเกือบทุกวัน (_2_) 5 – 6 วันต่อสัปดาห์

(_3_) 3 – 4 วันต่อสัปดาห์ (_4_) 1-2 ครั้งต่อสัปดาห์

(_5_) 1-2 ครั้งต่อเดือน (_6_) ทุกๆ สองถึงสามเดือน

(_7_) 1-2 ครั้งต่อปี

(_0_) ไม่ดื่มและไม่เคยดื่ม

H9. ปกติท่านดื่มเครื่องดื่มแอลกอฮอล์เฉลี่ยวันละกี่แก้ว _____ แก้ว/ขวด

การกำหนดเป้าหมาย

C1. จากนิสัยการรับประทานของท่าน เป้าหมายใดที่ท่านปรารถนาที่จะบรรลุ

(_1_) รักษาน้ำหนักให้เท่าเดิม
(_2_) ลดน้ำหนัก
(_3_) เพิ่มน้ำหนัก

C2. จากน้ำหนักปัจจุบันของท่าน ในอีก 6 เดือนข้างหน้า ท่านปรารถนาที่จะลด เพิ่มน้ำหนักจำนวน/_____ กิโลกรัม

C3. จากคำตอบของท่านในข้อ C1 – C2 ผู้วิจัยปรารถนาที่จะทราบความคิดเห็นของท่านตามข้อความด้านล่าง กรุณาเขียนตัวเลขหน้าข้อความดังกล่าวทุกข้อความ โดยกำหนดให้

1	2	3	4	5
ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เฉยๆ	เห็นด้วย	เห็นด้วยอย่างยิ่ง

_____ 1. มันยากที่จะทำเป้าหมายนี้อย่างจริงจัง
_____ 2. สำหรับฉัน มันเป็นไปไม่ได้ ที่จะบรรลุเป้าหมายนี้
_____ 3. อาจจะมีการปรับเป้าหมายภายหลังตามสถานการณ์
_____ 4. บอกตามตรง ฉันไม่สนใจหรอกว่า ฉันจะบรรลุเป้าหมายนี้หรือไม่
_____ 5. ฉันมีความตั้งใจอย่างแน่วแน่ที่จะไปให้ถึงเป้าหมายนี้
_____ 6. มันง่ายมากสำหรับฉันที่จะล้มเลิกเป้าหมายนี้
_____ 7. ฉันคิดว่ามันเป็นเป้าหมายที่ดีที่ฉันจะพุ่งชน
_____ 8. ฉันเต็มใจที่จะใช้ความพยายามมากกว่าปกติที่จะบรรลุเป้าหมายนี้
_____ 9. ฉันไม่ต้องใช้ความพยายามมากนักในการบรรลุเป้าหมายนี้

สถานการณ์การให้บริการโปรแกรม Personalised nutrition

จินตนาการว่ามีบริการที่จะช่วยให้ท่านบรรลุน้ำหนักตามเป้าหมายที่ท่านต้องการ ให้บริการโดยผู้เชี่ยวชาญทางการแพทย์ นักโภชนาการ และนักจิตวิทยา จะร่วมกันออกแบบโปรแกรมเพื่อควบคุมอาหารสำหรับท่านโดยเฉพาะ โดยพิจารณาจากคุณลักษณะทางพันธุกรรม บุคลิกภาพ สุขภาพ ดัชนีมวลกาย (BMI) และพฤติกรรมการรับประทานอาหารของท่านในปัจจุบัน โปรแกรมดังกล่าวนี้เรียกว่า Personalised nutrition (PN) โปรแกรมนี้จะช่วยให้ท่านมีโภชนาการที่ถูกต้อง ซึ่งจะทำให้ท่านบรรลุน้ำหนักเป้าหมายที่ท่านตั้งใจ อีกทั้งยังช่วยลดความเสี่ยงจากอาการเจ็บป่วยอันเนื่องมาจากภาวะน้ำหนักเกินและโรคอ้วน เช่น โรคเบาหวาน โรคหัวใจ และโรคมะเร็ง ได้อีกด้วย การให้บริการ PN จะมี 4 ขั้นตอน ดังนี้ แสดงแผนผังการให้บริการ)PN(:

1. แพทย์จะซักถามข้อมูลทั่วไปเกี่ยวกับสุขภาพ น้ำหนัก ส่วนสูง กิจกรรมในชีวิตประจำวัน พฤติกรรมการกิน ซึ่งรวมถึงอาการแพ้อาหารต่างๆ ของท่าน
2. ท่านจะได้รับการตรวจโภชนพันธุศาสตร์ (nutrigenomic test) เพื่อจะทราบถึงลักษณะทางพันธุกรรมและชนิดอาหารที่จะเหมาะสมกับท่าน ซึ่งจะทำให้ท่านลดความเสี่ยงของภาวะโรคอ้วนและโรคอื่นๆ ที่เกี่ยวข้องดังที่ได้กล่าวมาข้างต้น
3. เมื่อได้รับผลการตรวจโภชนพันธุศาสตร์ (nutrigenomic test) แพทย์ นักโภชนาการ และนักจิตวิทยายาจะร่วมกันวิเคราะห์ผลและออกแบบรายการอาหารที่เหมาะสมกับลักษณะทางโภชนพันธุศาสตร์ของท่าน รวมถึงคำแนะนำเพื่อให้ท่านบรรลุน้ำหนักเป้าหมายที่ท่านตั้งใจ
4. หลังจากที่ท่านได้รับคำแนะนำตามขั้นตอนของโปรแกรม PN ในเบื้องต้นแล้ว ทางศูนย์ PN จะนัดท่านทุกๆ สองสัปดาห์เพื่อประเมินและติดตามผลการปฏิบัติตามโปรแกรมที่ผู้เชี่ยวชาญให้คำแนะนำ รวมถึงการแลกเปลี่ยนความคิดเห็นระหว่างท่านกับผู้เชี่ยวชาญทั้งนักโภชการและนักจิตวิทยา เพื่อปรับเปลี่ยนแผนให้เหมาะสมกับภาวะร่างกายและจิตใจของท่านในปัจจุบัน

INT1. โปรแกรม Personalised nutrition ที่กล่าวมาข้างต้นยังไม่มีให้บริการในประเทศไทย สมมติว่า บริการนี้จะเกิดขึ้นในสัปดาห์หน้า ท่านคิดว่าท่านจะใช้บริการ Personalised nutrition นี้หรือไม่

(_1_) ฉันคิดว่าฉันจะต้องใช้บริการ Personalised nutrition อย่างแน่นอน

(_2_) ฉันคิดว่าฉันจะลองใช้บริการ Personalised nutrition

(_3_) ฉันไม่คิดจะลองใช้บริการ Personalised nutrition

(_4_) ฉันไม่คิดจะใช้บริการ Personalised nutrition อย่างแน่นอน

INT2. เหตุใดท่านจึงคิดว่าท่านจะไม่ใช้บริการดังกล่าว โปรดระบุ

(_1_) ฉันไม่ต้องการเพิ่มหรือลดน้ำหนัก

(_2_) ฉันไม่เชื่อว่าโปรแกรมนี้จะช่วยได้

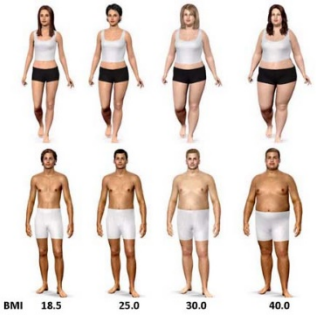
(_3_) ฉันไม่สามารถที่จะจ่ายได้

(_4_) ฉันเสียภาษีแล้ว และบริการนี้ควรจะฟรีสำหรับประชาชนทุกคน

(_5_) ฉันสามารถทำได้ด้วยตัวฉันเอง ซึ่งโปรแกรมนี้ไม่จำเป็นสำหรับฉัน

(_6_) อื่นๆ (โปรดระบุ)_____

Personalised Nutrition Programme



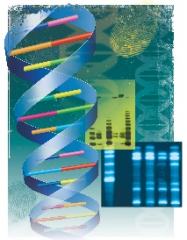
ผู้ที่มีความตั้งใจจะลดน้ำหนักรักษาระดับ/

มองหาคำแนะนำเพื่อบรรลุ

พบแพทย์/ผู้เชี่ยวชาญ

ขั้นตอนที่ 1

ข้อมูลการวินิจฉัยเบื้องต้น



ตรวจโภชนพันธุศาสตร์

Nutrigenomic test
(Genetic blood test)

ขั้นตอนที่ 2

ปรึกษาพูดคุยผลตรวจ
Nutrigenomic test
กับแพทย์ผู้เชี่ยวชาญ

ขั้นตอนที่ 3

คำแนะนำในการควบคุมน้ำหนักเพื่อ
ลดผลกระทบของภาวะโรคอ้วนและ
โรคต่างๆที่เกี่ยวข้อง

นักโภชนาการ/ผู้เชี่ยวชาญ

คำแนะนำเกี่ยวกับการควบคุมอาหาร

รายการอาหารแนะนำ

เทคนิคการเลือกเครื่องปรุง
วัตถุดิบ และอาหารที่
เหมาะสม

ปฏิบัติตามแผนโภชนาการ
และเฝ้าติดตามผลด้วยตัวเอง

ขั้นตอนที่ 4

แพทย์

นักโภชนาการ/ผู้เชี่ยวชาญ

ติดตามและประเมินผล พร้อมทั้งปรับ
แผนโภชนาการเดือนละ 2 ครั้ง

ผลลัพธ์ในเวลา ๖

บรรลุเป้าหมายน้ำหนักเป้าหมาย
และลดความเสี่ยงของโรคอันมี

ตารางด้านล่างแสดงจำนวนค่าใช้จ่ายรายเดือนสำหรับโปรแกรม PN ระยะเวลา 6 เดือน และ 1 ปี ขอให้ท่านเลือก**จำนวนเงินที่มากที่สุดต่อเดือน**ที่ท่านยินดีที่จะจ่ายเพื่อเข้าร่วมโปรแกรม PN ทั้งสองระยะเวลา ซึ่งจำนวนเงินดังกล่าวจะต้องอยู่ภายใต้ข้อจำกัดทางการเงินของท่าน โปรดพึงระลึกไว้ว่าการจ่ายเงินเพื่อเข้าร่วมโปรแกรมดังกล่าว จะทำให้เงินที่ท่านจะใช้จับจ่ายซื้อสินค้าและบริการอื่นๆ สำหรับชีวิตประจำวันลดน้อยลง

	รายเดือน สำหรับ 6 เดือน
(...)	฿ 0
(...)	฿ 834
(...)	฿ 1,000
(...)	฿ 1,500
(...)	฿ 1,667
(...)	฿ 2,000
(...)	฿ 2,500
(...)	฿ 2,584
(...)	฿ 2,667
(...)	฿ 2,750
(...)	฿ 2,834
(...)	฿ 2,917
(...)	฿ 3,000
(...)	฿ 3,084
(...)	฿ 3,167
(...)	฿ 3,250
(...)	฿ 3,334
(...)	฿ 3,417
(...)	฿ 3,500
(...)	฿ 3,584
(...)	฿ 3,667
(...)	฿ 3,750
(...)	฿ 3,834
(...)	฿ 3,917
(...)	฿ 4,000
(...)	฿ 4,084
(...)	฿ 4,167
(...)	฿ 4,250
(...)	฿ 4,334
(...)	฿ 4,417
(...)	฿ 4,500
(...)	฿ 4,584
(...)	฿ 4,667
(...)	฿ 4,750
(...)	฿ 4,834
(...)	฿ 4,917
(...)	฿ 5,000
(...)	มากกว่า ฿ 5,000
	โปรดระบุ_____

	รายเดือน สำหรับ 1 ปี
(...)	฿ 0
(...)	฿ 834
(...)	฿ 1,000
(...)	฿ 1,500
(...)	฿ 1,667
(...)	฿ 1,834
(...)	฿ 2,084
(...)	฿ 2,125
(...)	฿ 2,167
(...)	฿ 2,208
(...)	฿ 2,250
(...)	฿ 2,292
(...)	฿ 2,334
(...)	฿ 2,375
(...)	฿ 2,417
(...)	฿ 2,459
(...)	฿ 2,500
(...)	฿ 2,542
(...)	฿ 2,584
(...)	฿ 2,625
(...)	฿ 2,667
(...)	฿ 2,709
(...)	฿ 2,750
(...)	฿ 2,792
(...)	฿ 2,834
(...)	฿ 2,875
(...)	฿ 2,917
(...)	฿ 2,959
(...)	฿ 3,000
(...)	฿ 3,042
(...)	฿ 3,084
(...)	฿ 3,125
(...)	฿ 3,167
(...)	฿ 3,209
(...)	฿ 3,250
(...)	฿ 3,292
(...)	฿ 3,334
(...)	มากกว่า ฿ 3,334
	โปรดระบุ _____

ตารางด้านล่างแสดงจำนวนค่าใช้จ่ายสำหรับโปรแกรม PN ระยะเวลา 6 เดือน และ 1 ปี ขอให้ท่านเลือก**จำนวนเงินที่มากที่สุด**ที่ท่านยินดีที่จะจ่ายเพื่อเข้าร่วมโปรแกรม PN ทั้งสองระยะเวลา ซึ่งจำนวนเงินดังกล่าวจะต้องอยู่ภายใต้ข้อจำกัดทางการเงินของท่าน โปรดพึงระลึกไว้ว่าการจ่ายเงินเพื่อเข้าร่วมโปรแกรมดังกล่าว จะทำให้เงินที่ท่านจะใช้จับจ่ายซื้อสินค้าและบริการอื่นๆ สำหรับชีวิตประจำวันลดน้อยลง

6 เดือน		1 ปี	
(...)	฿ 0	(...)	฿ 0
(...)	฿ 5,000	(...)	฿ 10,000
(...)	฿ 10,000	(...)	฿ 20,000
(...)	฿ 12,500	(...)	฿ 22,500
(...)	฿ 15,000	(...)	฿ 25,000
(...)	฿ 15,500	(...)	฿ 25,500
(...)	฿ 16,000	(...)	฿ 26,000
(...)	฿ 16,500	(...)	฿ 26,500
(...)	฿ 17,000	(...)	฿ 27,000
(...)	฿ 17,500	(...)	฿ 27,500
(...)	฿ 18,000	(...)	฿ 28,000
(...)	฿ 18,500	(...)	฿ 28,500
(...)	฿ 19,000	(...)	฿ 29,000
(...)	฿ 19,500	(...)	฿ 29,500
(...)	฿ 20,000	(...)	฿ 30,000
(...)	฿ 20,500	(...)	฿ 30,500
(...)	฿ 21,000	(...)	฿ 31,000
(...)	฿ 21,500	(...)	฿ 31,500
(...)	฿ 22,000	(...)	฿ 32,000
(...)	฿ 22,500	(...)	฿ 32,500
(...)	฿ 23,000	(...)	฿ 33,000
(...)	฿ 23,500	(...)	฿ 33,500
(...)	฿ 24,000	(...)	฿ 34,000
(...)	฿ 24,500	(...)	฿ 34,500
(...)	฿ 25,000	(...)	฿ 35,000
(...)	฿ 25,500	(...)	฿ 35,500
(...)	฿ 26,000	(...)	฿ 36,000
(...)	฿ 26,500	(...)	฿ 36,500
(...)	฿ 27,000	(...)	฿ 37,000
(...)	฿ 27,500	(...)	฿ 37,500
(...)	฿ 28,000	(...)	฿ 38,000
(...)	฿ 28,500	(...)	฿ 38,500
(...)	฿ 29,000	(...)	฿ 39,000
(...)	฿ 29,500	(...)	฿ 39,500
(...)	฿ 30,000	(...)	฿ 40,000
(...)	มากกว่า ฿30,000 โปรดระบุ_____	(...)	มากกว่า ฿ 40,000 โปรดระบุ_____

ทฤษฎีความพยายามและความสามารถในการควบคุมการรับประทาน

ทฤษฎีความพยายาม

สถานการณ์	คะแนน	1	2	3	4	5	6	7
AS. คนที่ควบคุมอาหารเพื่อที่จะลดน้ำหนักรักษา/น้ำหนักให้คงที่/เพิ่มน้ำหนัก บางคนทำสำเร็จขณะที่บางคนทำไม่สำเร็จ สมมติว่าท่านเข้าร่วมบริการ Personalised nutrition ทำให้ท่าน**บรรลุเป้าหมายน้ำหนักที่ท่านตั้งไว้**ในหกเดือนข้างหน้า ท่านจะรู้สึกอย่างไรกับความสำเร็จนี้		ไม่ยินดีอย่างมากที่สุด	ไม่ยินดีอย่างมาก	ไม่ยินดี	เฉยๆ	ยินดี	ยินดีอย่างมาก	ยินดีอย่างมากที่สุด
		รู้สึกแย่ที่สุด	รู้สึกแย่มาก	รู้สึกแย่	เฉยๆ	รู้สึกดี	รู้สึกดีมาก	รู้สึกดีที่สุด
AF. สมมติว่าท่านเข้าร่วมโปรแกรม Personalised nutrition ใน 6 เดือนนับจากนี้ แต่สุดท้าย**ทำไม่สำเร็จ** ท่านจะรู้สึกอย่างไรกับความล้มเหลวนี้		ไม่ยินดีอย่างมากที่สุด	ไม่ยินดีอย่างมาก	ไม่ยินดี	เฉยๆ	ยินดี	ยินดีอย่างมาก	ยินดีอย่างมากที่สุด
		รู้สึกแย่ที่สุด	รู้สึกแย่มาก	รู้สึกแย่	เฉยๆ	รู้สึกดี	รู้สึกดีมาก	รู้สึกดีที่สุด
AP. สมมติว่าท่านเข้าร่วมโปรแกรม Personalised nutrition ใน 6 เดือนนับจากนี้ ท่านคิดว่า**การควบคุมน้ำหนัก**ของท่านจะเป็นอย่างไร		ไม่น่าสนุกอย่างที่สุด	ไม่น่าสนุกอย่างมาก	ไม่น่าสนุก	เฉยๆ	น่าสนุก	น่าสนุกอย่างมาก	น่าสนุกอย่างที่สุด
		รู้สึกแย่ที่สุด	รู้สึกแย่อย่างมาก	รู้สึกแย่	เฉยๆ	รู้สึกดี	รู้สึกดีมาก	รู้สึกดีที่สุด
SN. **บุคคลที่มีความสำคัญต่อท่าน** ที่แสดงความเห็นชอบหรือไม่เห็นชอบต่อการทำกิจกรรมต่างๆ ของท่าน ท่านคิดว่าบุคคลเหล่านี้จะเห็นชอบหรือไม่เห็นชอบ หากท่านเข้าโปรแกรม Personalised nutrition ในระยะเวลา 6 เดือนข้างหน้า		ไม่เห็นชอบอย่างที่สุด	ไม่เห็นชอบอย่างมาก	ไม่เห็นชอบ	เฉยๆ	เห็นชอบ	เห็นชอบอย่างมาก	เห็นชอบอย่างมากที่สุด
ES. สมมติว่าท่านเข้าโปรแกรม Personalised nutrition ในระยะเวลา 6 เดือนข้างหน้า ท่านคิดว่าเป็นไปได้เป็นไปไม่ได้ ที่ท่านจะ/**<u>บรรลุ</u>**น้ำหนักเป้าหมายของท่านอย่างแน่นอน		เป็นไปไม่ได้อย่างยิ่ง	เป็นไปไม่ได้อย่างมาก	เป็นไปไม่ได้	ทั้งเป็นไปได้และเป็นไปไม่ได้	เป็นไปได้	เป็นไปได้อย่างมาก	เป็นไปได้อย่างยิ่ง
EF. สมมติว่าท่านเข้าโปรแกรม Personalised nutrition ในระยะเวลา 6 เดือนข้างหน้า ท่านคิดว่าเป็นไปได้เป็นไปไม่ได้ ที่ท่านจะล้มเหลวในการบรรลุ/เป้าหมายของท่าน		เป็นไปไม่ได้อย่างยิ่ง	เป็นไปไม่ได้อย่างมาก	เป็นไปไม่ได้	ทั้งเป็นไปได้และเป็นไปไม่ได้	เป็นไปได้	เป็นไปได้อย่างมาก	เป็นไปได้อย่างยิ่ง
FT. ในช่วง**หนึ่งปีที่ผ่านมา** ท่านมีความพยายามที่จะลดน้ำหนักรักษาน้ำหนักให้คงที่/เพิ่มน้ำหนักบ่อยแค่ไหน	____ 1 = ไม่พยายาม ____ 2 = หนึ่งครั้ง ____ 3 = 2-3 ครั้ง ____ 4 = พยายามหลายครั้งแต่ไม่มาก ____ 5 = พยายามหลายครั้ง ____ 6 = พยายามหลายครั้งมากๆ							
RT. ในช่วง**หนึ่งเดือนที่ผ่านมา** ท่านมีความพยายามที่จะลดน้ำหนักรักษาน้ำหนักให้คงที่/เพิ่มน้ำหนักบ่อย/แค่ไหน	____ 1 = ไม่พยายาม ____ 2 = หนึ่งครั้ง ____ 3 = 2-3 ครั้ง ____ 4 = พยายามหลายครั้งแต่ไม่มาก ____ 5 = พยายามหลายครั้ง ____ 6 = พยายามหลายครั้งมากๆ							

ความสามารถในการควบคุมการกิน

โปรดให้คะแนนความสามารถของท่านในเรื่องความสามารถความคุมความอยากรับประทานอาหารต่อสิ่งเร้าในแต่ละสถานการณ์ต่างๆ ที่กำหนดให้ จาก 1 – 4 (1 = ควบคุมไม่ได้เลย 2 = ควบคุมไม่ได้ 3 = ควบคุมได้ และ 4 = ควบคุมได้อย่างแน่นอน)

ท่านสามารถควบคุมการกินได้...	1 = ควบคุมไม่ได้เลย 2 = ควบคุมไม่ได้ 3 = ควบคุมได้ 4 = ควบคุมได้อย่างยิ่ง
1. เมื่อมีอาหารหลากหลายชนิดจำนวนมากจัดเตรียมไว้	
2. เมื่อมีอาหารที่ให้พลังงานสูงจัดไว้ แม้จะเป็นอาหารจานโปรดของท่าน	
3. เมื่อท่านอยู่ในงานเลี้ยง	
4. แม้กระทั่งกรณีที่ท่านต้องปฏิเสธต่อผู้อื่น	
5. แม้กระทั่งกรณีที่มีคนกดดันให้ท่านกิน	
6. แม้กระทั่งกรณีที่ท่านรู้สึกว่าเป็นการไม่สุภาพที่จะปฏิเสธการเติมอาหาร	
7. เมื่อท่านมีความสุข	
8. เมื่อท่านรู้สึกหดหู่ใจ	
9. เมื่อท่านกำลังเผชิญกับความล้มเหลว	
10. ช่วงเวลาก่อนเข้านอน	
11. เมื่อท่านอยู่ในร้านอาหารประเภทบุฟเฟ่ต์ที่สามารถกินได้มากเท่าที่ท่านต้องการ	
12. เมื่อท่านกำลังอ่าน	
13. เมื่อท่านออกไปชอปปิ้ง	
14. เมื่อท่านอยู่ในสถานที่พิเศษในช่วงเวลาพักผ่อน	

ทัศนคติต่อความเสี่ยงและความพึงพอใจด้านเวลา

ทัศนคติต่อความเสี่ยง

R1. ท่านซื้อสลากกินแบ่งรัฐบาลหรือหวยใต้ดินบ้างหรือไม่ (_1_) ซื้อ (_0_) ไม่ซื้อ

R2. จากคำถาม R1 ถ้าท่านซื้อ ท่านซื้อสลากกินแบ่งรัฐบาลหรือหวยใต้ดินเฉลี่ยต่อเดือนเท่าไร _____ บาท

R3. ตารางด้านล่างแสดงเซทของลอตเตอรี่จำนวน 4 เซท แต่ละเซทประกอบด้วยลอตเตอรี่จำนวน 10 ใบ ซึ่งรวมลอตเตอรี่ที่มีโอกาสที่ท่านจะได้รับรางวัล 100 บาทอย่างแน่นอน โดยอีก 9 ใบจะมีโอกาสที่จะได้รับรางวัลแตกต่างกันลดหลั่นกันไป และมีโอกาสไม่ได้รับรางวัลเช่นกัน ซึ่งรางวัลของลอตเตอรี่และโอกาสที่จะได้รับรางวัลแต่ละใบแสดงในตารางด้านล่าง **ถ้าลอตเตอรี่ใบที่ท่านเลือกไม่ถูกรางวัล ผลตอบแทนที่ท่านจะได้คือ 0 บาท** ท่านสามารถเลือกลอตเตอรี่ได้เพียง 1 ใบจาก 10 ใบในแต่ละเซท โดยระบุเครื่องหมาย **X** ในช่องว่างใต้ลอตเตอรี่ที่ท่านเลือก

เซทที่ 1

โอกาสที่จะถูกรางวัล	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
เงินรางวัล (บาท)	100	111	125	143	167	200	250	333	500	1,000
ทางเลือก										

เซทที่ 2

โอกาสที่จะถูกรางวัล	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
เงินรางวัล (บาท)	100	122	150	186	233	300	400	567	900	1,900
ทางเลือก										

เซทที่ 3

โอกาสที่จะถูกรางวัล	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
เงินรางวัล (บาท)	100	167	250	357	500	700	1,000	1,500	2,500	5,500
ทางเลือก										

เซทที่ 4

โอกาสที่จะถูกรางวัล	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
เงินรางวัล (บาท)	100	222	375	571	833	1,200	1,750	2,667	4,500	10,000
ทางเลือก										

ความพึงพอใจด้านเวลา

T1. ท่านจะเลือกทางเลือกใดระหว่างทางเลือก A ที่จะได้รับเงินจำนวน 10,000 บาทในวันนี้ กับทางเลือก B รับเงินใน ปีถัดไป พร้อม 1 ผลตอบแทน โปรดระบุทางเลือกของท่านในตาราง

A. วันนี้	B. ปีถัดไป	ทางเลือก
10,000	11,000	A B
10,000	12,000	A B
10,000	13,000	A B
10,000	14,000	A B
10,000	15,000	A B
10,000	16,000	A B
10,000	17,000	A B
10,000	18,000	A B
10,000	19,000	A B
10,000	20,000	A B

T2. ในกรณีที่ท่านเลือกที่จะรับเงิน 10,000 บาทสำหรับทุกทางเลือกด้านบน (T1) อยากทราบว่า จำนวนเงินเท่าใดที่จะทำให้ท่านตัดสินใจเลือกรับเงินในปีถัดไปแทนที่จะรับเงิน 10,000 บาทในวันนี้ _____ บาท

T3. ท่านจะเลือกทางเลือกใดระหว่างทางเลือก A ที่จะได้รับเงินจำนวน 10,000 บาทในอีก ปีถัดไป 1 กับทางเลือก B รับเงินในอีก ปีถัดไป 2 พร้อมผลตอบแทน โปรดระบุทางเลือกของท่านในตาราง

A. ปีถัดไป	B. 2 ปีถัดไป	ทางเลือก
10,000	11,000	A B
10,000	12,000	A B
10,000	13,000	A B
10,000	14,000	A B
10,000	15,000	A B
10,000	16,000	A B
10,000	17,000	A B
10,000	18,000	A B
10,000	19,000	A B
10,000	20,000	A B

T9. สมมติว่าท่านได้รับโบนัสจำนวนเงิน 50,000 บาท ท่านจะเลือกรับเงินจำนวนดังกล่าวในวันนี้ หรือนำไปลงทุนในกองทุนของบริษัทท่านเป็นระยะเวลา 1 ปี และอัตราผลตอบแทนจากกองทุนควรจะเป็นเท่าใด จึงจะทำให้ท่านตัดสินใจลงทุนในกองทุนของบริษัทของท่าน

(_1_) รับเงินตอนนี้ (_2_) นำเงินไปลงทุนโดยผลตอบแทนที่คาดหวังคือ _____%

การประมาณความพึงพอใจ

กรุณาประเมินความพึงพอใจของท่านในด้านต่างๆ (S1 – S4) โดยกำหนดให้ 1 หมายถึง ไม่มีความพึงพอใจอย่างมากที่สุด และ 10 หมายถึง มีความพึงพอใจอย่างมากที่สุด

S1. ในภาพรวม ท่านมีความพึงพอใจ**ด้านคุณภาพชีวิต**ของท่านเพียงใด _____

S2. ในภาพรวม ท่านมีความพึงพอใจ**ด้านอาหารและโภชนาการ**ของท่านเพียงใด _____

S3. ในภาพรวม ท่านมีความพึงพอใจ**ด้านสุขภาพ**ของท่านเพียงใด _____

S4. ในภาพรวม ท่านมีความพึงพอใจ**ด้านรูปร่าง**ของท่านเพียงใด _____

Sensitivity to Punishment and Sensitivity to Reward Questionnaire

โปรดตอบคำถามแต่ละข้อโดยการทำเครื่องหมายวงกลม ใช่ หรือ ไม่ ในการตอบคำถามไม่มีคำตอบใดที่ถูกหรือผิด หรือพลิกแพลง โปรดตอบคำถามด้วยความฉับไวโดยไม่ต้องพิจารณาถึงความหมายอันลึกซึ้งของคำถาม

1.	ท่านมักจะหยุดทำบางอย่างเพราะคิดว่าท่านกำลังทำผิดกฎหมาย	ใช่	ไม่
2.	โอกาสในการได้มาซึ่งรายได้ (เงิน) โน้มน้าวให้ท่านลุกขึ้นมาทำบางสิ่งบางอย่าง	ใช่	ไม่
3.	ท่านมักจะไม่ร้องขอบางสิ่งบางอย่าง เมื่อท่านไม่แน่ใจว่าท่านได้รับสิ่งนั้น	ใช่	ไม่
4.	ท่านมักจะได้รับความมั่นใจในการกระทำสิ่งต่าง ๆ ผ่านคุณค่าในตัวท่านจากการทำงาน การศึกษา เพื่อนฝูงและครอบครัว	ใช่	ไม่
5.	ท่านมักจะกลัวที่จะเผชิญกับสถานการณ์ใหม่ หรือไม่ได้คาดคิด	ใช่	ไม่
6.	ท่านมักจะพบปะผู้คนที่ท่านคิดว่าน่าสนใจ	ใช่	ไม่
7.	มันเป็นการยากที่ท่านจะโทรศัพท์หาใครสักคนที่ท่านไม่รู้จัก	ใช่	ไม่
8.	ท่านยินดีที่จะทดลองยาเสพติดเพียงเพราะความสุขที่ท่านจะได้รับจากการเสพ	ใช่	ไม่
9.	ท่านมักจะเรียกร้องสิทธิ์เมื่อท่านทราบว่า ท่านสามารถที่จะหลีกเลี่ยงการเผชิญหน้า หรือปะทะคารมกับบุคคล หรือองค์กรนั้น ๆ	ใช่	ไม่
10.	ท่านมักจะทำสิ่งต่าง ๆ เพื่อให้ได้รับคำชมเชย	ใช่	ไม่
11.	เมื่อในวัยเด็ก ท่านเคยถูกทำโทษไม่ว่าจะเป็นที่บ้าน หรือ ที่โรงเรียน	ใช่	ไม่
12.	ท่านชอบที่จะเป็นที่ได้รับความสนใจในงานเลี้ยงทางสังคม	ใช่	ไม่
13.	ในหลาย ๆ งานที่ท่านไม่ได้เตรียมตัว ท่านให้ความสำคัญกับโอกาสที่จะเกิดความล้มเหลวด้วยหรือไม่	ใช่	ไม่
14.	ท่านใช้เวลามากเพื่อให้ได้มาซึ่งภาพลักษณ์ที่ดี	ใช่	ไม่
15.	ท่านสูญเสียความมั่นใจอย่างง่ายดายในสถานการณ์ลำบาก	ใช่	ไม่
16.	ท่านต้องการให้บุคคลอื่นแสดงความเอาใจใส่ต่อท่านตลอดเวลา	ใช่	ไม่
17.	ท่านเป็นคนขี้อาย	ใช่	ไม่
18.	เมื่อท่านอยู่ในกลุ่ม ท่านมักจะแสดงความคิดเห็นอย่างชาญฉลาด และอารมณ์ขันเป็นที่สุด	ใช่	ไม่
19.	เมื่อใดก็ตามที่เป็นไปได้ ท่านมักจะหลีกเลี่ยงการแสดงความกลัวที่จะเสียหน้า	ใช่	ไม่
20.	ท่านมักจะคว้าโอกาสในการเลือกพบกับบุคคลที่น่าสนใจ	ใช่	ไม่
21.	เมื่อท่านอยู่ในกลุ่ม ท่านรู้สึกว่าเป็นเรื่องยากที่จะหาเรื่องราวที่น่าสนใจมาพูดคุยในการสนทนา	ใช่	ไม่
22.	เมื่อวัยเด็ก ท่านทำหลายสิ่งหลายอย่างเพื่อที่จะได้รับการยอมรับ	ใช่	ไม่
23.	มันเป็นการยากที่จะเผลอหลับ เมื่อท่านนึกถึงสิ่งที่ท่านทำสำเร็จ หรือกำลังจะต้องทำ	ใช่	ไม่
24.	มีความเป็นไปได้ที่แรงขับเคลื่อนทางสังคม จะทำให้ท่านลงมือทำบางอย่าง ถึงแม้ว่ามันจะไม่ถูกต้อง	ใช่	ไม่
25.	ท่านครุ่นคิดหลายรอบ ก่อนที่จะร้องเรียนเกี่ยวกับอาหารที่ไม่ได้รับปรุงอยางถูกต้อง ในร้านอาหาร	ใช่	ไม่
26.	ท่านให้ความสนใจต่อกิจกรรมที่นำไปสู่ผลตอบแทนระยะสั้น	ใช่	ไม่
27.	ท่านจะรู้สึกไม่พอใจเมื่อท่านต้องย้อนกลับไปยังร้านค้า เมื่อท่านทราบภายหลังว่าท่านได้รับเงินทอนไม่ถูกต้อง	ใช่	ไม่
28.	ท่านมักจะประสบปัญหาในการต่อต้านต่อสิ่งเร้าในการกระทำสิ่งที่ผิด	ใช่	ไม่
29.	ท่านจะหลีกเลี่ยงไม่ไปในสถานที่ที่ท่านไม่รู้จัก หากเป็นไปได้	ใช่	ไม่
30.	ท่านชื่นชอบที่จะแข่งขันหรือทำในสิ่งที่ท่านสามารถจะเอาชนะได้	ใช่	ไม่

31.	ท่านมักจะกังวลในสิ่งที่ท่านได้พูดหรือกระทำไปแล้ว	ใช่	ไม่
32.	มันเป็นการง่ายสำหรับท่านที่จะเชื่อมโยงรสชาติและกลิ่นในสถานการณ์ที่พึงพอใจ	ใช่	ไม่
33.	มันเป็นการยากสำหรับท่านที่จะขอขึ้นเงินเดือนจากหัวหน้างาน	ใช่	ไม่
34.	มีหลายสิ่งหรือหลายความรู้สึก ที่คอยตือนความจำท่านเกี่ยวกับเหตุการณ์ที่ประทับใจ	ใช่	ไม่
35.	โดยปกติ ท่านจะหลีกเลี่ยงการพูดในที่สาธารณะ	ใช่	ไม่
36.	เมื่อท่านเริ่มที่จะเล่นการพนัน มันเป็นการยากสำหรับท่านที่จะหยุด	ใช่	ไม่
37.	โดยปกติ ท่านมักจะคิดว่าท่านสามารถที่จะทำสิ่งต่าง ๆ ได้มากมาย ถ้าท่านไม่รู้สึกกลัวหรือไม่รู้สึกไม่ปลอดภัย	ใช่	ไม่
38.	ในบางครั้ง ท่านทำหลาย ๆ สิ่งเพื่อให้ได้ผลตอบแทนระยะสั้น	ใช่	ไม่
39.	เมื่อเปรียบเทียบตัวท่านเองกับบุคคลอื่นที่ท่านรู้จัก ท่านมักจะกลัวในหลาย ๆ สิ่ง	ใช่	ไม่
40.	ท่านมักจะถูกเบี่ยงเบนความสนใจของท่านต่องานที่ทำ ให้กับสิ่งอื่น ๆ ที่น่าสนใจที่อยู่ต่อหน้าท่าน	ใช่	ไม่
41.	ท่านมักจะกังวลกับสิ่งต่าง ๆ ที่ทำงานได้ไม่สมบูรณ์ หรือได้รับความเสียหาย	ใช่	ไม่
42.	ท่านสนใจในเงินถึงขั้นที่ว่าสามารถจะทำงานที่มีความเสี่ยงได้	ใช่	ไม่
43.	ท่านมักจะหยุดทำในสิ่งที่ท่านชอบ เพื่อไม่ให้ได้รับการปฏิเสธหรือการต่อต้านจากบุคคลอื่น	ใช่	ไม่
44.	ท่านชื่นชอบให้มีการแข่งขันในทุก ๆ กิจกรรมของท่าน	ใช่	ไม่
45.	โดยปกติ ท่านจะให้ความสนใจกับเหตุการณ์ไม่ประทับใจ มากกว่าเหตุการณ์ประทับใจ	ใช่	ไม่
46.	ท่านต้องการที่จะเป็นบุคคลที่มีอิทธิพลทางสังคม	ใช่	ไม่
47.	ท่านมักจะหยุดทำบางสิ่งเพราะท่านกลัวที่จะเสียหน้า	ใช่	ไม่
48.	ท่านชื่นชอบที่จะแสดงความสามารถของท่าน ถึงแม้ว่าจะมีความเสี่ยงอันตราย	ใช่	ไม่

ข้อมูลทั่วไป

D1. ชื่อสกุล-: _____ ชื่อเล่น: _____

D2. ที่อยู่: _____

D3. เพศ: (_1_) ชาย (_2_) หญิง

D4. วันเกิด: วัน ____ เดือน _____ ค.ศ._____

D5. อีเมล: _____ โทร. _____

D6. การศึกษาสูงสุด:(_1_) มัธยมศึกษาตอนต้นหรือน้อยกว่า (_2_) มัธยมศึกษาตอนปลายหรือเทียบเท่า
(_3_) ปริญญาตรี (_4_) ปริญญาโท
(_5_) ปริญญาเอกหรือสูงกว่า

D7. สถานภาพสมรส: (_1_) โสด (_2_) สมรส
(_3_) ม่าย หย่าร้าง / แยกกันอยู่ /

D8. สถานที่ทำงาน: _____

D9. การประกอบอาชีพในปัจจุบัน: (_1_) ธุรกิจส่วนตัว (_2_) นายจ้าง
(_3_) ข้าราชการพนักงานของรัฐ/รัฐวิสาหกิจ/ (_4_) พนักงานบริษัทเอกชน
(_5_) ว่างงานและกำลังหางาน

D10. รายได้เฉลี่ยต่อเดือน: (_1_) ≤10,000 บาท (_2_) 10,001 – 20,000 บาท
(_3_) 20,001 – 30,000 บาท (_4_) 30,001 – 40,000 บาท
(_5_) 40,001 – 50,000 บาท (_6_) 50,001 – 60,000 บาท
(_7_) 60,001 – 70,000 บาท (_8_) 70,001 – 80,000 บาท
(_9_) 80,001 – 90,000 บาท (_10_) 90,001 – 100,000 บาท
(_10_) ≥ 100,001 บาท

D11. ค่าใช้จ่ายค่าอาหารเฉลี่ยต่อเดือน _____ บาท.

D12. ปัจจุบันท่านมีภาระหนี้สินหรือไม่ (_1_) มีหนี้สิน (_0_) ไม่มีหนี้สิน

D13. ท่านมีภาระค่าใช้จ่ายในระยะยาวเช่น ผ่อนบ้าน หรือรถ หรือไม่ (_1_) มี (_0_) ไม่มี

D14. ท่านมีภาระค่าใช้จ่ายในระยะสั้น เช่น ผ่อนชำระยอดบัตรเครดิต หรือไม่ (_1_) มี (_0_) ไม่มี

D15. จากบ้านท่านไปยังที่ทำงานโดยปกติท่านใช้เวลาเดินทางประมาณ _____ ชั่วโมง.

D16. โดยปกติการเดินทางจากบ้านไปยังที่ทำงาน ท่านเดินทางโดยวิธีใด
(_1_) รถสาธรณะ (_2_) รถส่วนบุคคล
(_3_) จักรยาน (_4_) เดิน

D17. ท่านอาศัยอยู่กับใคร (_1_) ครอบครัว (_2_) เพื่อน (_3_) อยู่คนเดียว

D18. พ่อแม่หรือพี่น้องของท่าน มีผู้ใดที่อยู่ในภาวะน้ำหนักเกินปกติหรือโรคอ้วนหรือไม่
(_1_) มี (_1_) พ่อ (_2_) แม่
(_3_) พี่ชายน้องชาย/ (_4_) พี่สาวน้องสาว/
(_0_) ไม่มี

D19. ท่านยินดีมีส่วนร่วมในงานวิจัยนี้ ในระยะที่ 2 ที่จะเกิดขึ้นในอีก 6 เดือนข้างหน้าหรือไม่
(_1_) ยินดี (_0_) ไม่ยินดี

D20. เป้าหมายที่ท่านปรารถนาที่จะพยายามเพื่อบรรลุเป้าหมายในอีก 6 เดือนข้างหน้าคือ
(_1_) รักษาน้ำหนักให้เท่าเดิม
(_2_) ลดน้ำหนัก
(_3_) เพิ่มน้ำหนัก

D21. จากเป้าหมายที่ท่านกำหนดข้างต้น D20 ในอีก **6 เดือนข้างหน้า** น้ำหนักที่ท่านปรารถนาจะลด เพิ่มคือ/_____ กิโลกรัม

Appendix A.2 Questionnaire for phase 2

Ref. no. _____

Date _____

Interviewer

Editor

The Second Survey (Phase 2)

Exercise

H1. Weight: _____ Kg.

H2. Have you exercised during last 6 months? (_1_) Yes (_0_) No (skip to H5)

H3. How many days per week do you exercise at least 30 minutes mod? _____ Days

H4. How many days per week do you exercise at least 30 minutes vigorous? _____ Days

H5. How often had an alcoholic drink?

(_1_) Yes

(_1_) Almost every day
(_2_) 5 – 6 days a week
(_3_) 3 – 4 days a week
(_4_) Once or twice a week
(_5_) Once or twice a month
(_6_) Once every couple of months
(_7_) Once or twice a year

(_0_) No, I do not drink alcohol at all

Goal setting

C1. Considering that in the previous survey you stated that your weight was ____, do you think that you have achieved your weight goal during the last 6 months?

(_1_) Yes (_2_) No

C2. Regarding your commitment to be on diet during the last 6 months, how satisfied do you feel?

Extremely dissatisfied	Very dissatisfied	Dissatisfied	Neither dissatisfied nor satisfied	Satisfied	Very satisfied	Extremely satisfied

C3. Considering what you have stated on the previous question-C1, we would like to know your opinion on the following statements on a scale ranging from strongly disagree to strongly agree. Please write a number next to each statement to indicate the extent to which **you agree or disagree with that statement.**

1	**2**	**3**	**4**	**5**
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

_____ 1. It was hard to take this goal seriously.

_____ 2. It was unrealistic for me to expect to reach this goal.

_____ 3. It was quite likely that this goal may need to be revised, depending on how things go.

_____ 4. Quite frankly, I didn't care if I achieve this goal or not.

_____ 5. I was strongly committed to pursuing this goal.

_____ 6. It wouldn't take much to make me abandon this goal.

_____ 7. I thought this is a good goal to shoot for.

_____ 8. I was willing to put forth a great deal of effort beyond what I'd normally do to achieve this goal.

_____ 9. There was not much to be gained by trying to achieve this goal.

C4. According to you experience of the last 6 months, would you like to continue your weight control?

(_1_) Yes (_2_) No

C5. If yes, what goal would you like to trying to achieve in the next 6 months?

(_1_) To stay about the same weight
(_2_) To lose weight
(_3_) To gain weight

C6. Thinking about the weight goal that you wanted to achieve during the last 6 months, please state your level of agreement/disagreement on the following statements that how much you can resist to eating from 1 - 4 (1 = Strongly disagree, 2 = Disagree, 3 = Agree and 4 = Strongly Agree) with each situation.

I could resist eating …	**Strongly disagree 1**	**Disagree 2**	**Agree 3**	**Strongly agree 4**
15. When there were many different kinds of food available.				
16. Even when high calorie foods were available. (my favourite foods)				
17. When I was at a party.				
18. Even when I had to say "no" to other.				
19. Even when others were pressuring me to eat.				
20. Even when I feel it was impolite to refuse a second helping.				
21. When I was happy.				
22. When I was depressed.				
23. When I had experienced failure.				
24. Just before going to bed.				
25. At buffet (all you can eat) restaurants.				
26. When I was reading.				
27. When I went out shopping.				
28. More than usual around holidays				

Scenario of personalised nutrition service

Imagine that the new service that was offered you last time is always available on the market to help you to achieve your weight goal. As you remember that the new service is offered by a pool of experts (GP, nutritionist and psychologists) who will personalise your diet taking into account aspects of your genes, personality, health status, body mass index, phenotype and your current diet. This is what expert call personalised nutrition.

Personalised nutrition will help you to follow a diet, which as well as helping you to achieve your stated weight goal will also help you to minimise risk of diseases related to obesity and overweight such as diabetes, heart disease and cancer. This service includes four stages (show card):

1. A doctor will collect information about your health status, physical activity, BMI, and dietary habits including food intolerances and allergies.
2. You will be offered a genetic blood test (nutrigenomic test) to understand the basis of your genes and what type of food you should consume to reduce the risk of developing obesity related diseases mentioned before.
3. The results of your nutrigenomic test will be discussed together with a GP, nutritionist and psychologist to prepare a list of foods, menus and recommendations that you have to follow to achieve your goal.
4. After this initial stage, you are required to visit the centre every two weeks. During these visits, you will be monitored in terms of progress towards the achievement of your stated weight goal and discuss your personal situation with a nutritionist and a psychologist.

The personalised nutrition service described above is not free and let's assume that it is available to you next week. What is your intention to try the personalised nutrition service?

(_1_) I strongly intend to try the personalised nutrition service
(_2_) I intend to try the personalised nutrition service
(_3_) I do not intend to try the personalised nutrition service
(_4_) I do not intend at all to try the personalised nutrition service

Please can you tell as why you do not intend to try this service:

(_1_) I do not want to gain or lose weight;

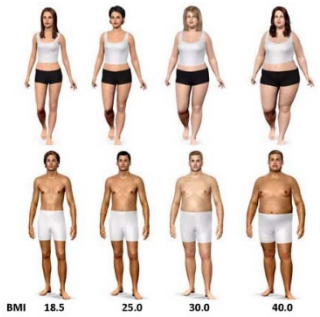
(_2_) I do not believe in this service;

(_3_) I cannot afford it;

(_4_) I pay taxes and thus this service should be free for all citizens;

(_5_) I can do it by myself, this service is not necessary for me;

(_6_) Other (Please specify): _____



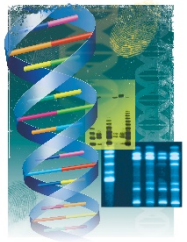
People truly commit to lose weight/ maintain weight/gain weight

Seeking advice to achieve your goal

Meeting a doctor/ specialist

1st step

Initial diagnostic information



Nutrigenomic test (Genetic blood test)

2nd step

Discussing nutrigenomics results with your doctor

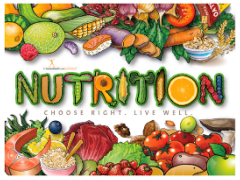
Recommendation to follow a customized diet to counteract obesity and related diseases

3rd step

Dietician/ specialist

Dietary recommendations

Menu plan



Tips for recipes, food choices and shopping lists

Applying dietary plan and self-monitoring

4th step

Doctor

Dietician/specialist

Reviewing and revision dietary plan twice a month

6 months outcomes

Achieving your weight desire and decreasing the risk of getting

However, the personalised nutrition service described above is not available on the market yet and we would like to know whether you are willing to pay for trying this service. Please look at the monetary values in ฿ per month shown in the tables below both for entering a personalised nutrition programme that lasts six months. Indicate the **maximum amount of money per month** that you are willing to pay for this service, but remember that your budget is limited and so spending money for a personalised nutrition service, you will have less money to buy other goods and/or services.

	Monthly WTP for 6 months
(…)	฿ 0
(…)	฿ 834
(…)	฿ 1,000
(…)	฿ 1,500
(…)	฿ 1,667
(…)	฿ 2,000
(…)	฿ 2,500
(…)	฿ 2,584
(…)	฿ 2,667
(…)	฿ 2,750
(…)	฿ 2,834
(…)	฿ 2,917
(…)	฿ 3,000
(…)	฿ 3,084
(…)	฿ 3,167
(…)	฿ 3,250
(…)	฿ 3,334
(…)	฿ 3,417
(…)	฿ 3,500
(…)	฿ 3,584
(…)	฿ 3,667
(…)	฿ 3,750
(…)	฿ 3,834
(…)	฿ 3,917
(…)	฿ 4,000
(…)	฿ 4,084
(…)	฿ 4,167
(…)	฿ 4,250
(…)	฿ 4,334
(…)	฿ 4,417
(…)	฿ 4,500
(…)	฿ 4,584
(…)	฿ 4,667
(…)	฿ 4,750
(…)	฿ 4,834
(…)	฿ 4,917
(…)	฿ 5,000
(…)	More than ฿ 5,000 Please specify ____

If you mark at 0, please can you tell as why you are willing to pay for this service?

_____

_____

_____

Please look at the monetary values in ฿shown in the tables below both for entering a personalised nutrition programme that lasts six months. Indicate the **maximum amount of money** that you are willing to pay for this service, but remember that your budget is limited and so spending money for a personalised nutrition service, you will have less money to buy other goods and/or services.

	WTP for 6 months
(…)	฿ 0
(…)	฿ 5,000
(…)	฿ 10,000
(…)	฿ 12,500
(…)	฿ 15,000
(…)	฿ 15,500
(…)	฿ 16,000
(…)	฿ 16,500
(…)	฿ 17,000
(…)	฿ 17,500
(…)	฿ 18,000
(…)	฿ 18,500
(…)	฿ 19,000
(…)	฿ 19,500
(…)	฿ 20,000
(…)	฿ 20,500
(…)	฿ 21,000
(…)	฿ 21,500
(…)	฿ 22,000
(…)	฿ 22,500
(…)	฿ 23,000
(…)	฿ 23,500
(…)	฿ 24,000
(…)	฿ 24,500
(…)	฿ 25,000
(…)	฿ 25,500
(…)	฿ 26,000
(…)	฿ 26,500
(…)	฿ 27,000
(…)	฿ 27,500
(…)	฿ 28,000
(…)	฿ 28,500
(…)	฿ 29,000
(…)	฿ 29,500
(…)	฿ 30,000
(…)	More than ฿30,000 Please specify _____

If you mark at 0, please can you tell as why you are willing to pay for this service?

_____

_____

_____

The theory of trying and Resistance to eating temptations

Thinking about the diet that you have undertaken during the last 6 months and the new service offered to you, please answer the following questions:

Situation	Score	1	2	3	4	5	6	7
AS. When people diet some succeed and some fail. If following the personalised nutrition service you experienced **success** in achieving your weight goal during the next six months, how would this make you feel?		Extremely unpleasant	Very unpleasant	Unpleasant	Neither unpleasant nor pleasant	Pleasant	Very pleasant	Extremely pleasant
		Extremely bad	Very bad	Negative	Neither bad nor good	good	Very good	Extremely good
AF. Suppose you followed the personalised nutrition service during the next six months **but did not succeed**. How would this make you feel?		Extremely unpleasant	Very unpleasant	Unpleasant	Neither unpleasant nor pleasant	Pleasant	Very pleasant	Extremely pleasant
		Extremely bad	Very bad	Negative	Neither bad nor good	good	Very good	Extremely good
AP. If you were following the personalised nutrition service during the next six months, **how would you describe the experience**?		Extremely unenjoyable	Very Unenjoyable	Unenjoyable	Neither unenjoyable nor enjoyable	enjoyable	Very enjoyable	Extremely enjoyable
		Extremely bad	Very bad	Negative	Neither bad nor good	good	Very good	Extremely good
SN. Most **people** who are important to you express approval or disapproval of your activities. Please tell us whether these people would approve or disapprove if you follow the personalised nutrition service during the next six months.		Totally disapprove	Strongly disapprove	Disapprove	Neither disapprove nor approve	Approve	Strongly approve	Completely approve
ES. Assuming I try to follow the personalised nutrition service during the next six months, it is likely/unlikely that I actually **would achieve** my goal.		Extremely unlikely	Very unlikely	Unlikely	Neither unlikely nor likely	Likely	Very likely	Extremely likely
EF. Assuming I try to following the personalised nutrition service during the next six months, it is likely/unlikely that I **would fail** to achieve my goal.		Extremely unlikely	Very unlikely	Unlikely	Neither unlikely nor likely	Likely	Very likely	Extremely likely
FT. During **the past year** I tried to achieve one of these actions--to lose weight, to maintain weight, or to gain weight.		_____ 1 = not at all _____ 2 = once _____ 3 = a couple of times _____ 4 = several times _____ 5 = many times _____ 6 = very many times						
RT. During **the last month** I tried to achieve one of these action--to lose weight, to maintain weight, or to gain weight.		_____ 1 = not at all _____ 2 = once _____ 3 = a couple of times _____ 4 = several times _____ 5 = many times _____ 6 = very many times						

Risk attitudes and time preferences

Risk attitudes

R1. Do you purchase the lottery tickets? (_1_) Yes (_0_) No

R2. From Q1 if yes how much do you spend to lottery tickets per month? _____ Baht

R3. Each one of the following four "panels" shows you 10 lotteries including a possibility to earn 100 Baht for sure. Each lottery has a probability of winning a prize otherwise nothing. The prize is the amount of Baht shown below the winning probability. **If you do not win the lottery, you earn 0 Baht**. Remember that you have to choose one lottery in each one of the four panels. Mark with an **X** the space corresponding to your choice.

Panel 1

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	111	125	143	167	200	250	333	500	1,000
Choice										

Panel 2

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	122	150	186	233	300	400	567	900	1,900
Choice										

Panel 3

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	167	250	357	500	700	1,000	1,500	2,500	5,500
Choice										

Panel 4

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	222	375	571	833	1,200	1,750	2,667	4,500	10,000
Choice										

Time preferences

T1. Which option would you prefer between receiving 10,000 Baht **now** (choice A) and Receiving the money **one year later** and get the return (choice B)? Please indicate your option by selecting the 10 choices giving below:

A. Today	B. Next year	Choice
10,000	11,000	A B
10,000	12,000	A B
10,000	13,000	A B
10,000	14,000	A B
10,000	15,000	A B
10,000	16,000	A B
10,000	17,000	A B
10,000	18,000	A B
10,000	19,000	A B
10,000	20,000	A B

T2. If you would prefer 10,000 Baht today for all situations above (T1), how much would you prefer for one year later instead 10,000 now? ฿_____

T3. Which option would you prefer between receiving 10,000 Baht **next year** (choice A) and Receiving the money **2 years later** and get the return (choice B)? Please indicate your option by selecting the 10 choices giving below:

A. Next year	B. Next 2 years	Choice
10,000	11,000	A B
10,000	12,000	A B
10,000	13,000	A B
10,000	14,000	A B
10,000	15,000	A B
10,000	16,000	A B
10,000	17,000	A B
10,000	18,000	A B
10,000	19,000	A B
10,000	20,000	A B

T4. Suppose you earned a bonus ฿50,000. You then had a choice between getting the money now or invest in your company fund for one year. How much rate return would the fund have to pay you in order for you to agree to invest the money with your company?

(_1_) Take the money now (_2_) Invest in fund and the return rate would be _____%

Satisfaction section

Please evaluate your satisfaction by using scale from 1 – 10 (totally dissatisfied to totally satisfied) follow:

S1. Overall how satisfied you are with your **life**? _____

S2. Overall how satisfied you are with your **diet**? _____

S3. Overall how satisfied you are with your **health**? _____

S4. Overall how satisfied you are with your **body shape**? _____

การสำรวจครั้งที่ 2

Ref. no. _____
ID _____
Interviewer _____
Date _____

ข้อมูลเกี่ยวกับการออกกำลังกาย

การออกกำลังกาย

H1 น้ำหนัก: _____ กิโลกรัม

H2 ช่วงระยะเวลา 6 เดือนที่ผ่านมา ท่านได้ออกกำลังกายเป็นประจำหรือไม่

(_1_) ใช่ (_0_) ไม่ (ข้ามไปข้อ H5)

H3 ท่านออกกำลังกายอย่างน้อย 30 นาทีแบบเบาๆ เช่น โยคะ วิ่งเหยาะๆ จำนวนกี่วันเฉลี่ยต่อสัปดาห์
_____ วัน/สัปดาห์

H4 ท่านออกกำลังกายอย่างน้อย 30 นาทีแบบจริงจัง (เช่น เล่นเทนนิส เดี่ยว, วิ่ง 10 กิโลเมตรขึ้นไป)

จำนวนกี่วันเฉลี่ยต่อสัปดาห์ _____ วัน/สัปดาห์

H5 ท่านดื่มเครื่องดื่มแอลกอฮอล์หรือไม่ ถ้าดื่มท่านดื่มบ่อยแค่ไหนในช่วง 6 เดือนที่ผ่านมา

(_1_) ดื่ม (_1_) ดื่มเกือบทุกวัน (_2_) 5 – 6 วันต่อสัปดาห์
(_3_) 3 – 4 วันต่อสัปดาห์ (_4_) 1-2 ครั้งต่อสัปดาห์
(_5_) 1-2 ครั้งต่อเดือน (_6_) ทุกๆ สองถึงสามเดือน
(_7_) 1-2 ครั้งต่อปี

(_0_) เลิกดื่ม/ไม่เคยดื่ม

การกำหนดเป้าหมาย

C1 น้ำหนักที่ท่านตั้งเป้าไว้เมื่อ 6 เดือนที่ผ่านมา ท่านคิดว่าท่านบรรลุเป้าหมายนั้นหรือไม่

(_1_) ใช่ (_0_) ไม่

C2 การควบคุมน้ำหนักของท่านในช่วงเวลา 6 เดือนที่ผ่านมา ท่านมีความพึงพอใจมากน้อยเพียงใด กรุณาใส่) (เครื่องหมาย √ ในช่องว่าง

ไม่พึงพอใจอย่างมากที่สุด	ไม่พึงพอใจอย่างมาก	ไม่พึงพอใจ	เฉยๆ	พึงพอใจ	พึงพอใจอย่างมาก	พึงพอใจอย่างมากที่สุด

C3 จากคำตอบของท่านในข้อ C1 ขอให้ท่าน**ประเมินผลการควบคุมน้ำหนักของท่านในช่วง 6 เดือนที่ผ่านมา** ผู้วิจัยปรารถนาที่จะทราบความคิดเห็นของท่านตามข้อความด้านล่าง กรุณาเขียนตัวเลขหน้าข้อความดังกล่าวทุกข้อความ โดยกำหนดให้

1	2	3	4	5
ไม่เห็นด้วยอย่างยิ่ง	**ไม่เห็นด้วย**	**เฉยๆ**	**เห็นด้วย**	**เห็นด้วยอย่างยิ่ง**

_____ 10. มันยากที่จะทำเป้าหมายนี้อย่างจริงจัง
_____ 11. สำหรับฉัน มันเป็นไปไม่ได้ ที่จะบรรลุเป้าหมายนี้
_____ 12. อาจจะมีการปรับเป้าหมายภายหลังตามสถานการณ์
_____ 13. บอกตามตรง ฉันไม่สนใจหรอกว่า ฉันจะบรรลุเป้าหมายนี้หรือไม่
_____ 14. ฉันมีความตั้งใจอย่างแน่วแน่ที่จะไปให้ถึงเป้าหมายนี้
_____ 15. มันง่ายมากสำหรับฉันที่จะล้มเลิกเป้าหมายนี้
_____ 16. ฉันคิดว่ามันเป็นเป้าหมายที่ดีที่ฉันจะพุ่งชน
_____ 17. ฉันเต็มใจที่จะใช้ความพยายามมากกว่าปกติที่จะบรรลุเป้าหมายนี้
_____ 18. ฉันไม่ต้องใช้ความพยายามมากนักในการบรรลุเป้าหมายนี้

C4 จากประสบการณ์การควบคุมน้ำหนักของท่านในช่วงระยะเวลา 6 เดือนที่ผ่านมา ท่านปรารถนาที่จะควบคุมน้ำหนักต่อไปหรือไม่

(_1_) ใช่ (_0_) ไม่ (ข้ามไปข้อ C6)

C5 ถ้าท่านต้องการควบคุมน้ำหนักต่อ เป้าหมายใดที่ท่านปรารถนาที่จะบรรลุ

(_1_) รักษาน้ำหนักให้เท่าเดิม
(_2_) ลดน้ำหนัก
(_3_) เพิ่มน้ำหนัก

C6 โปรดให้คะแนนความสามารถของท่านในเรื่องความสามารถความคุมความอยากรับประทานอาหารต่อสิ่งเร้า ในสถานการณ์ต่างๆ ที่กำหนดให้ ในช่วงระยะเวลา 6 เดือนที่ผ่านมา จาก 1 – 4 (1 = ควบคุมไม่ได้เลย 2 = ควบคุมไม่ได้ 3 = ควบคุมได้ และ 4 = ควบคุมได้อย่างแน่นอน)

ท่านสามารถควบคุมการกินได้...	1 = ควบคุมไม่ได้เลย 2 = ควบคุมไม่ได้ 3 = ควบคุมได้ 4 = ควบคุมได้อย่างยิ่ง
15. เมื่อมีอาหารหลากหลายชนิดจำนวนมากจัดเตรียมไว้	
16. เมื่อมีอาหารที่ให้พลังงานสูงจัดไว้ แม้จะเป็นอาหารจานโปรดของท่าน	
17. เมื่อท่านอยู่ในงานเลี้ยง	
18. แม้กระทั่งกรณีที่ท่านต้องปฏิเสธต่อผู้อื่น	
19. แม้กระทั่งกรณีที่มีคนกดดันให้ท่านกิน	
20. แม้กระทั่งกรณีที่ท่านรู้สึกว่าเป็นการไม่สุภาพที่จะปฏิเสธการเติมอาหาร	
21. เมื่อท่านมีความสุข	
22. เมื่อท่านรู้สึกหดหู่ใจ	
23. เมื่อท่านกำลังเผชิญกับความล้มเหลว	
24. ช่วงเวลาก่อนเข้านอน	
25. เมื่อท่านอยู่ในร้านอาหารประเภทบุฟเฟ่ต์ที่สามารถกินได้มากเท่าที่ท่านต้องการ	
26. เมื่อท่านกำลังอ่าน	
27. เมื่อท่านออกไปชอปปิ้ง	
28. เมื่อท่านอยู่ในสถานที่พิเศษในช่วงเวลาพักผ่อน	

สถานการณ์การให้บริการโปรแกรม Personalised nutrition

หากมีบริการที่จะช่วยให้ท่านบรรลุน้ำหนักตามเป้าหมายที่ท่านต้องการ ให้บริการโดยผู้เชี่ยวชาญทางการแพทย์ นักโภชนาการ และนักจิตวิทยา จะร่วมกันออกแบบโปรแกรมเพื่อควบคุมอาหารสำหรับท่านโดยเฉพาะ โดยพิจารณาจากคุณลักษณะทางพันธุกรรม บุคลิกภาพ สุขภาพ ดัชนีมวลกาย (BMI) และพฤติกรรมการรับประทานอาหารของท่านในปัจจุบัน โปรแกรมดังกล่าวนี้เรียกว่า Personalised nutrition (PN) โปรแกรมนี้จะช่วยให้ท่านมีโภชนาการที่ถูกต้อง ซึ่งจะทำให้ท่านบรรลุน้ำหนักเป้าหมายที่ท่านตั้งใจ อีกทั้งยังช่วยลดความเสี่ยงจากอาการเจ็บป่วยอันเนื่องมาจากภาวะน้ำหนักเกินและโรคอ้วน เช่น โรคเบาหวาน โรคหัวใจ และโรคมะเร็ง ได้อีกด้วย การให้บริการ PN จะมี 4 ขั้นตอน ดังนี้ แสดงแผนผังการให้บริการ)PN(:

5. แพทย์จะซักถามข้อมูลทั่วไปเกี่ยวกับสุขภาพ น้ำหนัก ส่วนสูง กิจกรรมในชีวิตประจำวัน พฤติกรรมการกิน ซึ่งรวมถึงอาการแพ้อาหารต่างๆ ของท่าน
6. ท่านจะได้รับการตรวจโภชนพันธุศาสตร์ (nutrigenomic test) เพื่อจะทราบถึงลักษณะทางพันธุกรรมและชนิดอาหารที่จะเหมาะสมกับท่าน ซึ่งจะทำให้ท่านลดความเสี่ยงของภาวะโรคอ้วนและโรคอื่นๆ ที่เกี่ยวข้องดังที่ได้กล่าวมาข้างต้น
7. เมื่อได้รับผลการตรวจโภชนพันธุศาสตร์ (nutrigenomic test) แพทย์ นักโภชนาการ และนักจิตวิทยายาจะร่วมกันวิเคราะห์ผลและออกแบบรายการอาหารที่เหมาะสมกับลักษณะทางโภชนพันธุศาสตร์ของท่าน รวมถึงคำแนะนำเพื่อให้ท่านบรรลุน้ำหนักเป้าหมายที่ท่านตั้งใจ
8. หลังจากที่ท่านได้รับคำแนะนำตามขั้นตอนของโปรแกรม PN ในเบื้องต้นแล้ว ทางศูนย์ PN จะนัดท่านทุกๆ สองสัปดาห์ เพื่อประเมินและติดตามผลการปฏิบัติตามโปรแกรมที่ผู้เชี่ยวชาญให้คำแนะนำ รวมถึงการแลกเปลี่ยนความคิดเห็นระหว่างท่านกับผู้เชี่ยวชาญทั้งนักโภชการและนักจิตวิทยา เพื่อปรับเปลี่ยนแผนให้เหมาะสมกับภาวะร่างกายและจิตใจของท่านในปัจจุบัน

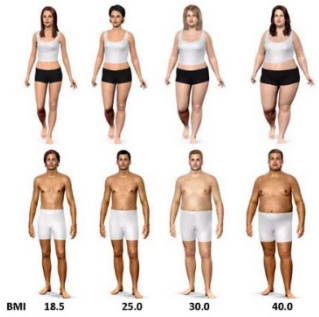
INT1. โปรแกรม Personalised nutrition ที่กล่าวมาข้างต้นยังไม่มีให้บริการในประเทศไทย สมมติว่า บริการนี้จะเกิดขึ้นในสัปดาห์หน้า ท่านคิดว่าท่านจะใช้บริการ Personalised nutrition นี้หรือไม่

(_1_) ฉันคิดว่าฉันจะต้องใช้บริการ Personalised nutrition อย่างแน่นอน
(_2_) ฉันคิดว่าฉันจะลองใช้บริการ Personalised nutrition
(_3_) ฉันไม่คิดจะลองใช้บริการ Personalised nutrition
(_4_) ฉันไม่คิดจะใช้บริการ Personalised nutrition อย่างแน่นอน

INT2. เหตุใดท่านจึงคิดว่าท่านจะไม่ใช้บริการดังกล่าว โปรดระบุ

(_1_) ฉันไม่ต้องการเพิ่มหรือลดน้ำหนัก
(_2_) ฉันไม่เชื่อว่าโปรแกรมนี้จะช่วยได้
(_3_) ฉันไม่สามารถที่จะจ่ายได้
(_4_) ฉันเสียภาษีแล้ว และบริการนี้ควรจะฟรีสำหรับประชาชนทุกคน
(_5_) ฉันสามารถทำได้ด้วยตัวฉันเอง ซึ่งโปรแกรมนี้ไม่จำเป็นสำหรับฉัน
(_6_) อื่นๆ (โปรดระบุ)_____

Personalised Nutrition Programme



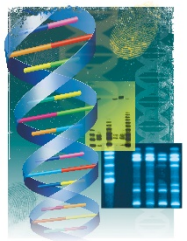
ผู้ที่มีความตั้งใจจะลดน้ำหนักรักษาระดับ/

มองหาคำแนะนำเพื่อบรรลุ

พบแพทย์/ผู้เชี่ยวชาญ

ขั้นตอนที่ 1

ข้อมูลการวินิจฉัยเบื้องต้น



ตรวจโภชนพันธุศาสตร์

Nutrigenomic test
(Genetic blood test)

ขั้นตอนที่ 2

ปรึกษาพูดคุยผลตรวจ
Nutrigenomic test
กับแพทย์ผู้เชี่ยวชาญ

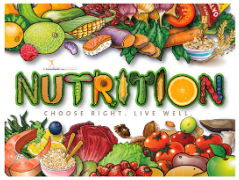
ขั้นตอนที่ 3

ดำแนะนำในการควบคุมน้ำหนักเพื่อลดผลกระทบของภาวะโรคอ้วนและโรคต่างๆที่เกี่ยวข้อง

นักโภชนาการ/ผู้เชียวชาญ

ดำแนะนำเกี่ยวกับการควบคุมอาหาร

รายการอาหารแนะนำ



เทคนิคการเลือกเครื่องปรุง
วัตถุดิบ และอาหารที่
เหมาะสม

ปฏิบัติตามแผนโภชนาการ
และเฝ้าติดตามผลด้วยตัวเอง

ขั้นตอนที่ 4

แพทย์

นักโภชนาการ/ผู้เชี่ยวชาญ

ติดตามและประเมินผล พร้อมทั้งปรับ
แผนโภชนาการเดือนละ 2 ครั้ง

ผลลัพธ์ในเวลา ๖

บรรลุเป้าหมายน้ำหนักเป้าหมาย
และลดความเสี่ยงของโรคอันมี

ตารางด้านล่างแสดงจำนวนค่าใช้จ่ายรายเดือนสำหรับโปรแกรม PN ระยะเวลา 6 เดือน ขอให้ท่านเลือก**จำนวนเงินที่มากที่สุดต่อเดือน**ที่ท่านยินดีที่จะจ่ายเพื่อเข้าร่วมโปรแกรม PN ทั้งสองระยะเวลา ซึ่งจำนวนเงินดังกล่าวจะต้องอยู่ภายใต้ข้อจำกัดทางการเงินของท่าน โปรดพึงระลึกไว้ว่าการจ่ายเงินเพื่อเข้าร่วมโปรแกรมดังกล่าว จะทำให้เงินที่ท่านจะใช้จับจ่ายซื้อสินค้าและบริการอื่นๆ สำหรับชีวิตประจำวันลดน้อยลง

	รายเดือน สำหรับ 6 เดือน
(...)	฿ 0 *
(...)	฿ 834
(...)	฿ 1,000
(...)	฿ 1,500
(...)	฿ 1,667
(...)	฿ 2,000
(...)	฿ 2,500
(...)	฿ 2,584
(...)	฿ 2,667
(...)	฿ 2,750
(...)	฿ 2,834
(...)	฿ 2,917
(...)	฿ 3,000
(...)	฿ 3,084
(...)	฿ 3,167
(...)	฿ 3,250
(...)	฿ 3,334
(...)	฿ 3,417
(...)	฿ 3,500
(...)	฿ 3,584
(...)	฿ 3,667
(...)	฿ 3,750
(...)	฿ 3,834
(...)	฿ 3,917
(...)	฿ 4,000
(...)	฿ 4,084
(...)	฿ 4,167
(...)	฿ 4,250
(...)	฿ 4,334
(...)	฿ 4,417
(...)	฿ 4,500
(...)	฿ 4,584
(...)	฿ 4,667
(...)	฿ 4,750
(...)	฿ 4,834
(...)	฿ 4,917
(...)	฿ 5,000
(...)	More than ฿ 5,000

*เหตุใดท่านจึงไม่มีความยินดีจ่ายเพื่อเข้าร่วมโปรแกรม

ตารางด้านล่างแสดงจำนวนค่าใช้จ่ายแบบเหมาจ่ายสำหรับโปรแกรม PN ระยะเวลา 6 เดือน ขอให้ท่านเลือก**จำนวนเงินที่มากที่สุด**ที่ท่านยินดีที่จะจ่ายเพื่อเข้าร่วมโปรแกรม PN ทั้งสองระยะเวลา ซึ่งจำนวนเงินดังกล่าวจะต้องอยู่ภายใต้ข้อจำกัดทางการเงินของท่าน โปรดพึงระลึกไว้ว่าการจ่ายเงินเพื่อเข้าร่วมโปรแกรมดังกล่าว จะทำให้เงินที่ท่านจะใช้จับจ่ายซื้อสินค้าและบริการอื่นๆ สำหรับชีวิตประจำวันลดน้อยลง

	แบบเหมาจ่ายสำหรับ 6 เดือน
(...)	฿ 0*
(...)	฿ 5,000
(...)	฿ 10,000
(...)	฿ 12,500
(...)	฿ 15,000
(...)	฿ 15,500
(...)	฿ 16,000
(...)	฿ 16,500
(...)	฿ 17,000
(...)	฿ 17,500
(...)	฿ 18,000
(...)	฿ 18,500
(...)	฿ 19,000
(...)	฿ 19,500
(...)	฿ 20,000
(...)	฿ 20,500
(...)	฿ 21,000
(...)	฿ 21,500
(...)	฿ 22,000
(...)	฿ 22,500
(...)	฿ 23,000
(...)	฿ 23,500
(...)	฿ 24,000
(...)	฿ 24,500
(...)	฿ 25,000
(...)	฿ 25,500
(...)	฿ 26,000
(...)	฿ 26,500
(...)	฿ 27,000
(...)	฿ 27,500
(...)	฿ 28,000
(...)	฿ 28,500
(...)	฿ 29,000
(...)	฿ 29,500
(...)	฿ 30,000
(...)	มากกว่า ฿30,000

*เหตุใดท่านจึงไม่มีความยินดีจ่ายเพื่อเข้าร่วมโปรแกรม

ทฤษฎีความพยายามและความสามารถในการควบคุมการรับประทาน

จากพฤติกรรมการรับประทานของท่านในช่วงระยะเวลา 6 เดือนที่ผ่านมา หากท่านเข้าร่วมโปรแกรม Personalised nutrition service ขอให้ท่านประเมินความเห็นของท่านต่อข้อความดังต่อไปนี้

สถานการณ์	**คะแนน**	1	2	3	4	5	6	7
AS. คนที่ควบคุมอาหารเพื่อที่จะลดน้ำหนักรักษา/น้ำหนักให้คงที่/เพิ่มน้ำหนัก บางคนทำสำเร็จ ขณะที่บางคนทำไม่สำเร็จ สมมติว่าท่านเข้าร่วม บริการPersonalised nutrition ทำให้ท่าน**บรรลุเป้าหมายน้ำหนักที่ท่านตั้งไว้**ในหกเดือนข้างหน้า ท่านจะรู้สึกอย่างไรกับความสำเร็จนี้		ไม่ยินดีอย่างมากที่สุด	ไม่ยินดีอย่างมาก	ไม่ยินดี	เฉยๆ	ยินดี	ยินดีอย่างมาก	ยินดีอย่างมากที่สุด
		รู้สึกแย่ที่สุด	รู้สึกแย่มาก	รู้สึกแย่	เฉยๆ	รู้สึกดี	รู้สึกดีมาก	รู้สึกดีที่สุด
AF. สมมติว่าท่านเข้าร่วมโปรแกรม Personalised nutrition ใน 6 เดือนนับจากนี้ แต่สุดท้าย**ทำไม่สำเร็จ** ท่านจะรู้สึกอย่างไรกับความล้มเหลวนี้		ไม่ยินดีอย่างมากที่สุด	ไม่ยินดีอย่างมาก	ไม่ยินดี	เฉยๆ	ยินดี	ยินดีอย่างมาก	ยินดีอย่างมากที่สุด
		รู้สึกแย่ที่สุด	รู้สึกแย่มาก	รู้สึกแย่	เฉยๆ	รู้สึกดี	รู้สึกดีมาก	รู้สึกดีที่สุด
AP. สมมติว่าท่านเข้าร่วมโปรแกรม Personalised nutrition ใน 6 เดือนนับจากนี้ ท่านคิดว่า**การควบคุมน้ำหนัก**ของท่านจะเป็นอย่างไร		ไม่น่าสนุกอย่างที่สุด	ไม่น่าสนุกอย่างมาก	ไม่น่าสนุก	เฉยๆ	น่าสนุก	น่าสนุกอย่างมาก	น่าสนุกอย่างที่สุด
		รู้สึกแย่ที่สุด	รู้สึกแย่อย่างมาก	รู้สึกแย่	เฉยๆ	รู้สึกดี	รู้สึกดีมาก	รู้สึกดีที่สุด
SN. **บุคคลที่มีความสำคัญต่อท่าน** ที่แสดงความเห็นชอบหรือไม่เห็นชอบต่อการทำกิจกรรมต่างๆ ของท่าน ท่านคิดว่าบุคคลเหล่านี้จะเห็นชอบหรือไม่เห็นชอบ หากท่านเข้าโปรแกรม Personalised nutrition ในระยะเวลา 6 เดือนข้างหน้า		ไม่เห็นชอบอย่างที่สุด	ไม่เห็นชอบอย่างมาก	ไม่เห็นชอบ	เฉยๆ	เห็นชอบ	เห็นชอบอย่างมาก	เห็นชอบอย่างมากที่สุด
ES. สมมติว่า ท่านเข้าโปรแกรม Personalised nutrition ในระยะเวลา 6 เดือนข้างหน้า ท่านคิดว่า เป็นไปได้เป็นไปไม่ได้ ที่ท่านจะ/**<u>บรรลุ</u>**น้ำหนักเป้าหมายของท่านอย่างแน่นอน		เป็นไปไม่ได้อย่างยิ่ง	เป็นไปไม่ได้อย่างมาก	เป็นไปไม่ได้	ทั้งเป็นไปได้และเป็นไปไม่ได้	เป็นไปได้	เป็นไปได้อย่างมาก	เป็นไปได้อย่างยิ่ง
EF. สมมติว่า ท่านเข้าโปรแกรม Personalised nutrition ในระยะเวลา 6 เดือนข้างหน้า ท่านคิดว่า เป็นไปได้เป็นไปไม่ได้ ที่ท่านจะล้มเหลวในการ/บรรลุเป้าหมายของท่าน		เป็นไปไม่ได้อย่างยิ่ง	เป็นไปไม่ได้อย่างมาก	เป็นไปไม่ได้	ทั้งเป็นไปได้และเป็นไปไม่ได้	เป็นไปได้	เป็นไปได้อย่างมาก	เป็นไปได้อย่างยิ่ง
FT. ในช่วง**หนึ่งปีที่ผ่านมา** ท่านมีความพยายามที่จะลดน้ำหนักรักษาน้ำหนักให้คงที่/เพิ่มน้ำหนัก/บ่อยแค่ไหน	_____ 1 = ไม่พยายาม _____ 2 = หนึ่งครั้ง _____ 3 = 2-3 ครั้ง _____ 4 = พยายามหลายครั้งแต่ไม่มาก _____ 5 = พยายามหลายครั้ง _____ 6 = พยายามหลายครั้งมากๆ							
RT. ในช่วง**หนึ่งเดือนที่ผ่านมา** ท่านมีความพยายามที่จะลดน้ำหนักรักษาน้ำหนักให้คงที่/เพิ่ม/น้ำหนักบ่อยแค่ไหน	_____ 1 = ไม่พยายาม _____ 2 = หนึ่งครั้ง _____ 3 = 2-3 ครั้ง _____ 4 = พยายามหลายครั้งแต่ไม่มาก _____ 5 = พยายามหลายครั้ง _____ 6 = พยายามหลายครั้งมากๆ							

ทัศนคติต่อความเสี่ยงและความพึงพอใจด้านเวลา

ทัศนคติต่อความเสี่ยง

R1. ท่านซื้อสลากกินแบ่งรัฐบาลหรือไม่ (_1_) ซื้อ (_0_) ไม่ซื้อ

R2. จากคำถาม R1 ถ้าท่านซื้อ ท่านมีค่าใช้จ่ายสำหรับสลากกินแบ่งรัฐบาลเฉลี่ยต่อเดือนเท่าไร _____ บาทเดือน/

R3. ตารางด้านล่างแสดงเซทของลอตเตอรี่จำนวน 4 เซท แต่ละเซทประกอบด้วยลอตเตอรี่จำนวน 10 ใบ ซึ่งรวมลอตเตอรี่ที่มีโอกาสที่ท่านจะได้รับรางวัล 100 บาทอย่างแน่นอน โดยอีก 9 ใบจะมีโอกาสที่จะได้รับรางวัลแตกต่างกันลดหลั่นกันไป และมีโอกาสไม่ได้รับรางวัลเช่นกัน ซึ่งรางวัลของลอตเตอรี่และโอกาสที่จะได้รับรางวัลแต่ละใบแสดงในตารางด้านล่าง **ถ้าลอตเตอรี่ใบที่ท่านเลือกไม่ถูกรางวัล ผลตอบแทนที่ท่านจะได้คือ 0 บาท** ท่านสามารถเลือกลอตเตอรี่ได้เพียง 1 ใบจาก 10 ใบในแต่ละเซท โดยระบุเครื่องหมาย X ในช่องว่างใต้ลอตเตอรี่ที่ท่านเลือก

เซทที่ 1

โอกาสที่จะถูกรางวัล	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
บาท	100	111	125	143	167	200	250	333	500	1,000
ทางเลือก										

เซทที่ 2

โอกาสที่จะถูกรางวัล	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
บาท	100	122	150	186	233	300	400	567	900	1,900
ทางเลือก										

เซทที่ 3

โอกาสที่จะถูกรางวัล	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
บาท	100	167	250	357	500	700	1,000	1,500	2,500	5,500
ทางเลือก										

เซทที่ 4

โอกาสที่จะถูกรางวัล	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
บาท	100	222	375	571	833	1,200	1,750	2,667	4,500	10,000
ทางเลือก										

ความพึงพอใจด้านเวลา

T1. ท่านจะเลือกทางเลือกใดระหว่างทางเลือก A ที่จะได้รับเงินจำนวน 10,000 บาทในวันนี้ กับทางเลือก B รับเงินใน ปีถัดไป พร้อมผลตอบแทน 1 โปรดระบุทางเลือกของท่านในตาราง

A. วันนี้	B. ปีถัดไป	ทางเลือก
10,000	11,000	A B
10,000	12,000	A B
10,000	13,000	A B
10,000	14,000	A B
10,000	15,000	A B
10,000	16,000	A B
10,000	17,000	A B
10,000	18,000	A B
10,000	19,000	A B
10,000	20,000	A B

T2. ในกรณีที่ท่านเลือกที่จะรับเงิน 10,000 บาทสำหรับทุกทางเลือกด้านบน อยากทราบว่า จำนวนเงินเท่าใดที่จะทำให้ท่านตัดสินใจเลือกรับเงินในปีถัดไปแทนที่จะรับเงิน 10,000 บาทในวันนี้ _____ บาท

T3. ท่านจะเลือกทางเลือกใดระหว่างทางเลือก A ที่จะได้รับเงินจำนวน 10,000 บาทในอีก ปีถัดไป 1 กับทางเลือก B รับเงินในอีก ปีถัดไป 2พร้อมผลตอบแทน โปรดระบุทางเลือกของท่านในตาราง

A. ปีถัดไป	B. 2 ปีถัดไป	ทางเลือก
10,000	11,000	A B
10,000	12,000	A B
10,000	13,000	A B
10,000	14,000	A B
10,000	15,000	A B
10,000	16,000	A B
10,000	17,000	A B
10,000	18,000	A B
10,000	19,000	A B
10,000	20,000	A B

T9. สมมติว่าท่านได้รับโบนัสจำนวนเงิน 50,000 บาท ท่านจะเลือกรับเงินจำนวนดังกล่าวในวันนี้ หรือลงทุนในกองทุนของบริษัทท่านเป็นระยะเวลา 1 ปี อัตราผลตอบแทนจากกองทุนควรจะเป็นเท่าใด ที่จะทำให้ท่านตัดสินใจลงทุนในกองทุนของบริษัทของท่าน

(_1_) _____% (_2_) รับเงินตอนนี้

การประมาณความพึงพอใจ

กรุณาประเมินความพึงพอใจของท่านในด้านต่างๆ (S3 – S6) โดยกำหนดให้ 0 หมายถึง ไม่มีความพึงพอใจอย่างมากที่สุด และ 10 หมายถึง มีความพึงพอใจอย่างมากที่สุด

S3. ในภาพรวม ท่านมีความพึงพอใจด้าน**คุณภาพชีวิต**ของท่านเพียงใด _____

S4. ในภาพรวม ท่านมีความพึงพอใจด้าน**อาหารและโภชนาการ**ของท่านเพียงใด _____

S5. ในภาพรวม ท่านมีความพึงพอใจด้าน**สุขภาพ**ของท่านเพียงใด _____

S6. ในภาพรวม ท่านมีความพึงพอใจด้าน**รูปร่าง**ของท่านเพียงใด _____

Appendix B Poster paper presented at EAAE 2017

CONSUMERS' ACCEPTANCE OF PERSONALISED NUTRITION PROGRAMME IN THAILAND: IMPACT OF ATTITUDES, RISK AND TIME PREFERENCES ON TRYING AND WILLINGNESS TO PAY

Suwanna Sayruamyat, Giuseppe Nocella and Nikos Georgantzis

Abstract

This paper applies the theory of trying (TOT) in connection with risk and time preferences to estimate WTP for a personalised nutrition programme (PNP) in Thailand. WTP for this new technological service was elicited via payment cards and estimated using a two stage Heckman model. Results show that attitudes, subjective norms, risk attitudes and time preferences strongly influence WTP for the proposed PNP. Findings provide insights for marketers and policy makers to facilitate the introduction of PNP, which could motivate consumers to make more sustainable healthy choices.

Keywords: Theory of Trying, Risk attitudes, Time preferences, WTP, Personalised Nutrition Programme.

Introduction

Since 1980, the international double growth of overweight and obesity epidemic indicates that consumers' lifestyle is worsening in many countries around the world. It is well known that the raise of obesity prevalence is mainly caused by lack of physical activity and unhealthy eating behaviours leading to diseases such as high blood pressure, diabetes, cancer etc. and premature death. Many persons try to fight against obesity and related diseases losing weight with healthy diets and doing physical activity, but fail to maintain these behaviours in the long term (Mann et al., 2007). As regards healthy dietary choices, failure to comply with weight goals can be explained by unfair and misleading advertising strategies which tempt consumers towards unhealthy food and short term gratification food choices (buy one get one free promotion) (Romero and Biswas, 2016). These marketing tools threat self-control of individuals because they are not capable of controlling their weight and thus achieving their established diet goals (Naylor et al., 2009). Furthermore, imbalanced power between producers and buyers do not allow consumers to influence food systems in terms of producing and processing healthy food products. These aspects cause a situation of information failure which does not allow consumers to make better choices not only in western countries but also in Asian countries like Thailand.

Thais' dietary behaviour is shifting towards unhealthy food because of the increase of fast food companies and the growth of the food industry which is oriented to increase the quantity and variety of processed food available in the market (Thumrungsi, 2014). This is a significant challenge for policy makers who want to reduce negative externalities caused by obesity forcing stakeholders working along supply chains to provide consumers with sustainable food choices. The recent European research project "Food4me" provides useful insight to adopt new technology based Personalised Nutrition (PN). PN is a relatively new concept that links the genotype of individuals with their health risks advising them on specific diets that they should follow to prevent

diseases to which they might be exposed sooner or late in their life (Joost et al., 2007). Taking into account for this innovation, the food industry could take advantage of these market opportunities producing *ad hoc* food products which could help consumers making sustainable choices to prevent health risks that might develop because of their genotypes.

In the context of obesity, PN is a new technology that can help consumers to achieve weight loss goals, which are considered notoriously difficult to reach and maintain. When individuals achieve their weight loss goals, they not only fail to maintain it but they go back to their previous status even gaining more weight (Mann et al., 2007). In social science research, PN has been evaluated in relation to consumer acceptance. For example, Poínhos et al. (2014) provide useful insights about psychological factors that predict intentions to accept PN. It will be more efficient to individually provide advice via PN than using public dietary guidance (Fallaize et al., 2013; San-Cristobal et al., 2015). From this point of view, it is important to evaluate the intention of consumers to adopt PN, which will help them to shift from obesity and overweight conditions to a normal Body Mass Index. In consumer research, understanding attitudes, beliefs and behaviours can minimise threats of losing personal control (Chaxel, 2016) and different psychological models were applied to explore the power of attitudes on intention toward performing a certain behaviour (Sheppard et al., 1988; Ajzen, 1991). One of these models states in the case of goals achievement, "intention" is a significant moderator for decision making and "trying" is the necessary process to achieve the established goal (Bagozzi and Warshaw, 1990). To explore this idea, Bagozzi and Warshaw (1990) proposed the Theory of Trying (TOT), which aims at explaining the gap between decision and action stages of consumption behaviours. As weight control is a complex process and very challenging to succeed, huge effort is strongly needed to achieve the weight goal (Bagozzi and Yi, 1989; Bagozzi et al., 1990; Mann et al., 2007). TOT captures three elements of attitudes: attitude toward trying and succeeding (AS), attitude toward trying and failing (AF) and attitude toward process of trying (AP) i.e. consequences of trying that lead to the goal achievement. The TOT model also considers individual perceived behavioural control in terms of expectation of the outcomes and subjective norms (SN), which is construct used in several studies to investigate how social pressure influence on individual behaviours (Ajzen, 1991; Bagozzi and Edwards, 1998). The TOT conceptual framework also differs from other expectancy value models because TOT takes past behaviour into account. Bagozzi and Warshaw (1990) argue that past trying should be a predictor of intention to trying because attitudes are self-generated and influence behaviour partially. When individuals feel unclear about their intention to achieve a goal, the frequency of past trying is a decent factor that helps deciding on trying and taking actions.

Attitudes, in the field of economics have been significantly associated with health behaviours and outcomes (Anderson and Mellor, 2008; de Oliveira et al., 2015), but so far only few studies have explored how psychological constructs can influence consumers stated preferences (Bennett et al., 2002; Nocella et al., 2012) and how attitudes can predict WTP (Lawless et al., 2015). However, to date there are no studies exploring contemporarily how psychological elements, risk and time preferences can influence willingness to pay (WTP) for PN. Risk attitudes and time preferences are paramount to understand trade-offs that individuals make between short term gratifications and long term benefits, which seems to be the case of food choices made by obese and overweight people. In order to fill such a gap, this study applies the TOT to explore and to assess whether Thai consumers are willing to try a personalised

nutrition programme (PNP) helping them to achieve weight loss goals. In particular, this study explores whether Thai consumers are willing to enter a personalised nutrition programme (PNP) helping them to lose weight. As a result, this study will extend the TOT to understand and estimate consumers' trying and WTP of PNP in Thailand.

In particular, this study extends the TOT exploring how the elements of this conceptual framework, time preferences and risk attitudes influence WTP for a new health service based on the concept of PN i.e. PNP. The paper also includes the investigation on how much consumers are willing to pay for PNP benefits to achieve individual weight goal. This study also evaluates how risk attitudes and time preferences influence consumer's WTP for the PN related to achieve the weight goal. The next section will give details of the proposed conceptual framework, data collection methods and econometric modelling. Section 3 will present the results, while section 4 will draw conclusions.

Methodology

1) Conceptual framework

Figure B.1 shows the conceptual framework used in this study, where the traditional elements of TOT are highlighted in part A and the extended components in part B. Part A indicates the proximal components of the model and indicates that the higher the attitudes towards success (ATT_SUC) and process (ATT_PRO), the higher is the intention to achieve weight loss goals using the proposed PNP, while for attitudes towards failure (ATT_FAI), the higher the scores, the lower is the intention to lose weight. Part A also shows that subjective norms (SN) influence positively ITT for PNP when individuals are encouraged by referent groups toward healthier life style. Part B shows the distal or extended elements of the model and illustrates that in this specific context ITT can be influenced by risk attitudes, time preferences, habits, body mass index and socio-economic characteristics of respondents. Part A and Part B are linked by ITT and WTP for the proposed PNP helping participants to achieve weight goals. As a result, a questionnaire was developed and divided into three sections to measure the proximal and distal elements of the proposed extended conceptual framework of TOT, and WTP for the proposed PNP.

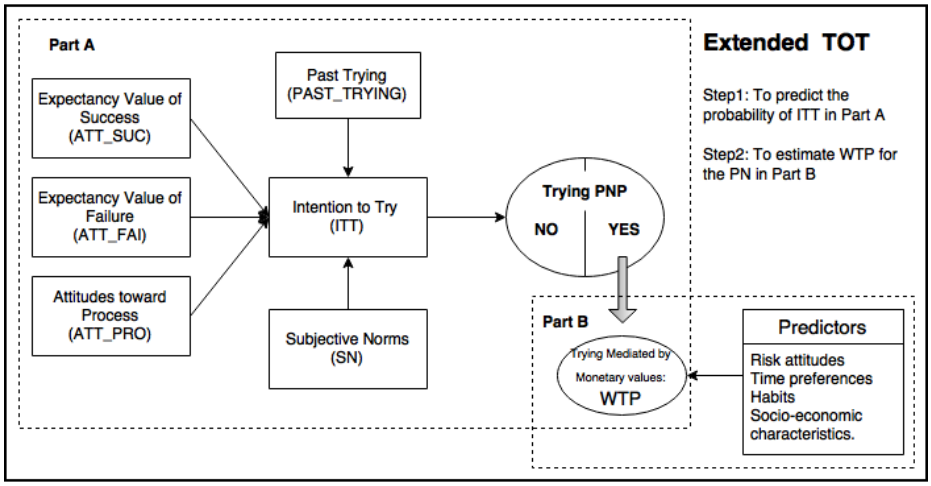


Figure B.1 Conceptual framework of extension of TOT with WTP for the PN service

2) Measurement of proximal elements

Attitudes were measured following Bagozzi and Warshaw approach using for ATT_SUC and ATT_FAI expectancy values scores, and for ATT_PRO a global measure of attitudes. For example, as regards the value component (AS) was elicited asking respondents to answer the following statement "When people diet some succeed and some fail. If you are trying the proposed PNP and during the next six months you succeed to achieve your weight goal, this would make you feel". This statement was measured on a seven-point bipolar scale labelled at its extremities with the bipolar adjectives 'unpleasant' and 'pleasant'. The expectancy component of success (ES) was elicited asking respondents "Assuming I try to follow the PNP during the next six months, it is likely/unlikely that I would succeed to achieve my goal". ES was measured on a seven-point likelihood scale ranging from 'extremely unlikely' to 'extremely likely'. This approach was also used to measure ATT_FAIL and SN[4] components of the TOT model, while ATT_PRO was elicited asking respondents how much they would enjoy following the proposed PNP during the next six months on a seven-point itemised rating scale ranging from unenjoyable to extremely enjoyable. Past trying behaviours was instead captured asking respondents to indicate the frequency of past trying to control their weight on a six-point scale ranging from 'never' to 'very many times'.

3) Measurement of WTP for PNP

After having shown participants a card illustrating the PNP that was offered to them, WTP for PNP was elicited through two steps. In the first step participants had to express their intention to try PNP. Participants who did not intend to try the proposed PNP were not asked to state their WTP but to indicate reasons of their refusal such as: 'I do not want to gain or lose weight', 'I do not believe in this service', 'I cannot afford it', 'I pay taxes and thus this service should be free for all citizens' and so on. In the second step, only participants who were willing to try the new service were asked to state their WTP via a payment card. The monetary values of the payment card were piloted with a small sample of individuals who were asked to state their maximum WTP for the proposed PNP. Piloting showed that maximum payments for the PNP could be compared to that of gym fee, and other losing weight programmes available in the Thai market. The final vector of bids for lump sum payment used in this survey was 5, 10, 12.5, 15, 15.5, 16, 16.5, 17, 17,5, 18, 18.5, 19, 19.5, 20, 20.5, 21, 21.5, 22, 22.5, 23, 23.5, 24, 24.5, 25, 25.5, 26, 26.5, 27, 27.5, 28, 28.5, 29, 29.5, 30 and more than 30 (Unit: thousand THB). All bids of a lump sum payment were divided by 6 to ask the WTP for monthly payment card.

4) Measurement of distal elements

Risk attitudes (RISK) were elicited by using larger-gain format of the SGG lottery-panel test (Sabater-Grande and Georgantzis, 2002). The SGG lottery-panel test considers both effects of large stakes and mixed outcome lotteries. As shown in Figure B.2, the lottery contains four panels and each panel has 10 lotteries including a possibility to earn THB100 for sure. Each lottery presents a probability of winning otherwise nothing. All panels start with 100% of wining at THB100 and decrease the

[4] A version of the questionnaire used for this study can be sent to researcher.

winning probabilities to 10% in the lottery 10, while stakes increased. Panel increments are larger moving from panel 1 to panel 4 by increasing risk premium. The risk premiums of Panel 1 to Panel 4 were 0.001, 100, 500 and 1000, respectively.

Panel 1

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	111	125	143	167	200	250	333	500	1,000
Choice										

Panel 2

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	122	150	186	233	300	400	567	900	1,900
Choice										

Panel 3

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	167	250	357	500	700	1,000	1,500	2,500	5,500
Choice										

Panel 4

Probability of winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Reward (Baht)	100	222	375	571	833	1,200	1,750	2,667	4,500	10,000
Choice										

Figure B.2 The SGG-panel lottery

The elicitation format of this lottery allows participants to be classified into risk seeker and risk averse. Risk-averse participants choose a lottery closer to the left-hand side of the panel, while risk seeker or risk neutral participants choose values of the lottery closer to the right of panel. Moreover, participants were elicited sensitivity to increasing risk premium (RISK_SEN) by looking at differences between panel 1 and panel 4 answers. RISK_SEN was categorised participants into three groups. The first group was the insensitive with risk premium if the answers of both panels were identical. The second group was the decreasing risk aversion group ($RISK\_SEN_{DRE}$) when the panel 1's answer was less than the panel 4's answer. The final group was the increasing risk aversion ($RISK\_SEN_{INC}$) when the panel 1's answer is more than the panel 4's answer.

Time preferences (TIME) were measured asking participants to indicate their preferences between receiving THB10,000 now and receiving the money later for a larger amount. The return rate started from 10% of initial money and increased every 10% up to 100% (THB20,000). When participants select THB10,000 for all choices, they were asked to state their preferred amount for one year after. The first switching point from immediate receiving to delayed receiving was the preferred return rate and thus the distal predictor of WTP for PNP. This study also investigates the sensitivity to initial starting time. Participants were asked to provide their preferred option between receiving THB10,000 next year and receiving the money two years later for a larger amount using the approached mentioned above. The difference in the switching point between two situations informs individual sensitivity to initial starting time, which was categorised into three groups as no sensitive, decreasing time discounting ($TIME\_SEN_{DRE}$) and increasing time discounting ($TIME\_SEN_{INC}$).

Body Mass Index (BMI) was obtained from self-reported weight and height. Although self-reported dispositions may be criticised as biased, which Sutin (2013) confirms other studies reporting that stated measures are highly correlated with measured weight and height values ($r=.98$ and $r=.92$, respectively). Furthermore, the study investigated drinking and smoking behaviours to represent habits related to risky health behaviours.

The questionnaire also included a set of questions related to socio-demographic characteristics of respondents.

5) Econometric analysis

WTP for PNP represents the link between the proximal psychological construct of TOT and the extended components of risk attitudes, time preferences, habits and socio-demographic and economic characteristics of respondents (Figure B.1). In order to link the two parts of the proposed model the Heckman sample selection model was used to estimate ITT and WTP for PNP by using a systems of simultaneous equations (Heckman, 1974). The first step of the estimation procedure explores how the proximal TOT components influence ITT for PNP. The first step was performed using a standard probit regression with linearly observed explanatory variables as follows:

$$ITT_i^* = z_i'\gamma + \nu_i \quad (1)$$

Where ITT_i^* is the latent variable of intention toward trying the PNP and z_i' represents is the vector of the psychological components of the TOT (ATT_SUC, ATT_FAIL, ATT_PRO, PAST_TRYING).

The trying component was extended to observe WTP for PNP elicited via payment card as explained above. In reality, the functional form of WTP is unknown and the maximum WTP for PNP was estimated using the indirect utility function:$WTP_i^* = x_i'\beta + \mu_i$. Given that $WTP_i^*$is the latent variable of observed WTP, the expected WTP value is a conditional expectation of true WTP (WTP_i^*) when a participant intends to try the PNP (ITT_i = 1). As a result, the outcome model of the second stage is captured by the following equation (2):

$$E(WTP_i|x_i, z_i) = E(WTP_i^*|ITT_i = 1, x_i, z_i) = x_i'\beta + \rho\sigma_\mu \frac{\emptyset(z_i'\gamma)}{\Phi(z_i'\gamma)} = x_i'\beta + \rho\sigma_\mu\lambda(z_i'\gamma) \quad (2)$$

Where β is the vector of regression coefficients of the outcome model in Part B (i.e. RISK, RISK_SEN, TIME, TIME_SEN, BMI, DRINKING, SMOKING etc.). $\mu_i$is an error term assumed to be normal distributed ($\mu \sim N(0, \sigma^2)$). Given $\beta_\lambda = \rho\sigma_\mu$ and $\alpha_\nu = (0 - z_i\gamma)/\sigma_\nu$, $\lambda(\alpha_\nu) \equiv \frac{\emptyset(z_i'\gamma)}{\Phi(z_i'\gamma)}$ represents inversed Mills ratio. If the correlation between μ_i and $\nu_i$is zero (ρ=0), the expected WTP equal $x_i'\beta$. Both the selected model and the outcome model will be estimated using a maximum likelihood procedure. Socio-economic characteristics such as age, income, gender, education and type of employment will be included as predictors of the expected WTP in Part B.

Data collection

The sample is made of 597 volunteers who were recruited in Bangkok advertising the study in several small businesses and governmental offices. People who accepted to take part in the study were interviewed face-to-face at the Centre for Applied Economics Research of Kasetsart University between November and December 2015. The research study was designed and conducted under compliance with the ethical guideline of the University of Reading.

Results

1) Socio-demographic and psychographic characteristic of participants

Results show that the majority of participants were women (60.8%) and educated at university level (85%) and with a gross monthly income between THB 10,000 and THB 30,000 (64.7%). Although the sample might appear biased in relation to education, this result reflects the current situation in the Bangkok area where about 96% of people have at least a degree. Thus, when recruiting an effort was made to oversample people not having a degree. The age of participants ranged from17 to 74 years with an average age of 32 (s =10.04) and with 50% of participants working for private companies, 31.2% for governmental organisations and 20.9% running their own businesses. The analysis of the stated BMI showed that 46.4% were categorised as being normal weight, 29.15% being overweight and 17.25% being obese.

As regards attitudes, more than 3/5 of participants (62.81%) were willing to try the proposed PNP to achieve personal weight goals. The average expectancy value of success (ATT_SUC) was 25.79 and more than two times greater than the average value of ATT_FAI (11.87). Furthermore, exploring mean differences between intenders (ITT) and no-intenders groups (NITT) for the proximal elements of the TOT, findings indicate that the ITT group scored higher than NITT on ATT_SUC ($\bar{x}_{ITT}$ =27.3, $\bar{x}_{NITT}$ =23.2), ATT_PRO ($\bar{x}_{ITT}$ =4.9, $\bar{x}_{NITT}$ =4.4) and SN ($\bar{x}_{ITT}$ =4.8, $\bar{x}_{NITT}$ =4.3). These differences were significant to independent sample t-tests as follows: ATT_SUC (t= -6.23; p=0.001), ATT_PRO (t= - 6.74; p=0.001) , SN (t= -6.42, p=0.001). For ATT_FAI and PAST_TRYING, no significant differences were observed between the two groups. In relation to the distal components of the extended TOT model, RISK shows that the average selected winning probability of all panels was not different between ITT and NITT groups ($\bar{x}_{ITT}$=55.23% and $\bar{x}_{NITT}$= 55.91%). When considering sensitivity to increasing risk premium (RISK_SEN), half of participants were not sensitive, 14.4% of participants decreased risk aversion, and 36.4% increased risk aversion. Finally, TIME was very different between the two groups. The ITT participants had a lower TIME than NITT ($\bar{x}_{ITT}$ =75.84% vs. $\bar{x}_{NITT}$ =105.99%) and this difference was significant to the independent sample t-test (t= 2.29, $p < 0.05$). When initial starting time was postponed to receive immediate reward from today to next year (TIME_SEN), 46.1% of total participants increased their time discounting, 17.3% decreased it and 36.4% kept it constant.

2) Impact of proximal and distal elements of TOT on WTP for PNP

The probit model in Table B.1 shows that ATT_PRO, SN and ATT_SUC were strongly positive correlated with ITT, whereas ATT_FAI and PAST_TRYING did not influence ITT. Marginal effects illustrate that an increase of 1 unit score in ATT_PRO and SN increase the probability of ITT by 9.1% and 8.2% respectively. ATT_SUC had a small effect on ITT by .9% when its expectancy value increases 1 unit.

The results of full maximum likelihood estimation of the Heckman model are presented in Table B.2. Regarding the fit of the model, the residuals between selection and outcome models were strongly correlated and had negative effects on WTP for PNP. Thus, this means that there was a sample selection bias which is captured by the Heckman model identifying NITT participants having a probability of WTP for PNP.

WTP also increases by THB120 and THB108, which were approximately 10% of expected WTP, Whereas, ATT_SUC had a small effect on WTP for PNP. Table B.2 shows that RISK is strongly and positively influencing WTP both payment methods. Moreover, when the probability of RISK increases by one WTP for the ITT group increases by THB 4.21 for monthly payment and by THB 2.63 for the lump sum payment. This means that a high risk averse person is willing to pay for a PNP more than a low risk averse person. Table B.2 also shows that TIME is negatively correlated with WTP for PNP. This result could be explained by the fact that a patient person (lower TIME) is likely to pay more for the proposed service. In addition, participants who were sensitive to TIME would like to pay more than insensitive participants. Although, $TIME\_SEN_{DRE}$ shows weak significance ($p<0.1$) to predict WTP for the PNP, participants who decrease time discounting are likely to pay more than others for monthly payments.

Table B.1 Coefficients and marginal effects of proximal elements on intention to try PNP

Proximal elements	*Z* parameters	How much to intend trying PNP
ATT_SUC	$.027^{***}$	.009
ATT_FAI	$-.008^{NS}$	- .002
ATT_PRO	$.267^{***}$	.090
PAST_TRYING	$.063^{NS}$	.021
SN	$.216^{***}$	.073
Constant	-2.70^{***}	-
Log-likelihood	- 352.69	
LR chi2(5)	82.5	
Pseudo R2	.1048	

NOTE: The marginal effects were calculated at mean. ***:significant at 1%, ^{NS}: non-significant

Habits related to risky health behaviour also indicate different effects on WTP between the two types of payments explored in this study. DRINKING has a strong and negative effect on the monthly payment, while SMOKING has a weak and negative effect on the lump sum payment. The negative effects of both behaviours indicate that participants who drink alcohol or smoke would like to pay less for the PNP compared no smokers or an-alcohol drinkers. BMI strongly impacts positively WTP with the lump sum payment only. For the ITT group, when BMI increases by one unit WTP for PNP increases by THB21.23, while for NITT by THB13.24.

As regards socio-economic characteristics, FEMALE and EDU are not significant while the other variables are significant. AGE and INCOME influence strongly WTP for PNP both for monthly and lump sum payments. AGE is negatively correlated with WTP especially for lump sum payment probably because older participants as well as being less interested in this service have less available income for a lump sum payment. INCOME is also significant and positive but less influential when considering the probability of ITT. MARRIED participants are willing to pay less than non-married participants. EMPLOY is strongly and negatively correlated with WTP for both payments. The negatively significant coefficients of $EMPLOY_{GOV}$ only and $EMPLOY_{PRI}$ stressed that employers or self-employed are willing to pay higher than

employees. The larger negatively magnitudes of coefficients in lump sum payment imply that employees are willing to pay more with monthly payment rather than lump sum payment, especially among employees who work in the private company. A significant interaction effect between TIME and $EMPLOY_{PRI}$ particularly is identified for the lump sum payment. This interaction emphasises that types of employment are correlated with time preferences and relate to make a different decision on WTP. This finding shows that the TIME lines of employers are the same parallel with and $EMPLOY_{GOV}$, but the TIME line of $EMPLOY_{PRI}$ was special. The discounting slope of $EMPLOY_{PRI}$ is positive contrasted with others, which have negative discounting slopes.

Finally, Figure B.3 shows that the average expected WTP for the monthly payment is higher than WTP for the lump sum payment and this difference is statistically significant to the paired sample t-test ($t = 36.06$, $p < .001$).

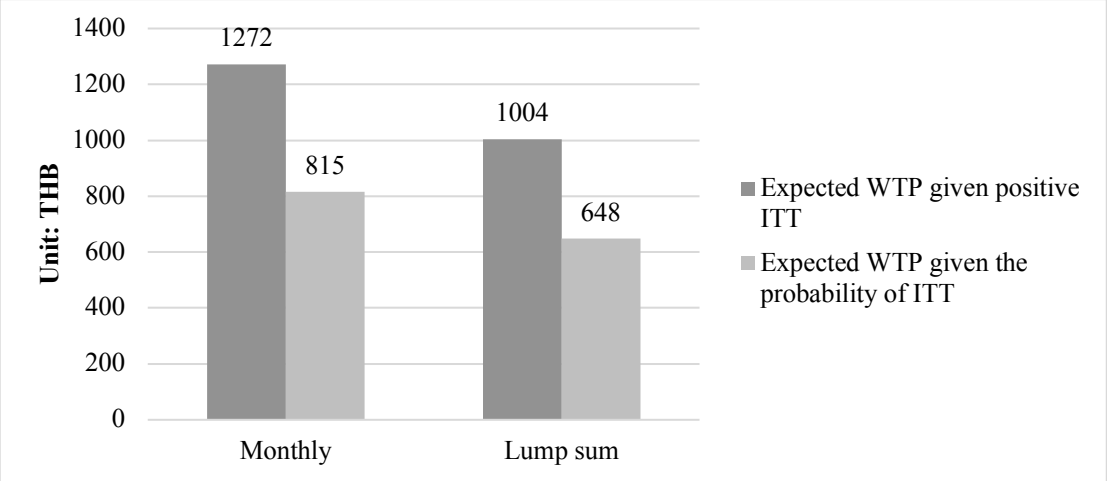


Figure B.3 Comparison of WTP for the PNP between monthly and lump sum payments. Exchange rate: THB53 = 1GBP.

Table B.2 Coefficients and marginal effects of proximal and distal elements on WTP for the PNP

	β	Marginal effect: WTP| ITT>0	Marginal effect: WTP| p(ITT)	β	Marginal effect: WTP| ITT>0	Marginal effect: WTP| p(ITT)
RISK	4.21***	4.21***	2.62***	2.63**	2.63**	1.64**
RISK_SEN$_{DRE}$	34.59NS	34.59NS	21.58NS	28.97NS	28.97NS	18.07NS
RISK_SEN$_{INC}$	149.07NS	149.07NS	93.02NS	-17.12NS	-17.12NS	-10.68NS
TIME	-1.14***	-.007NS	-0.003NS	-1.03**	.38NS	0.24NS
TIME_SEN$_{DRE}$	202.55**	202.55**	126.39**	169.53*	169.53*	105.75*
TIME_SEN$_{INC}$	174.01NS	174.01NS	108.58 NS	168.51*	168.51*	105.11*
TIME*EMPLOY$_{GOV}$	.90NS	-	-	.43NS	-	-
TIME*EMPLOY$_{PRI}$	1.78*	-	-	2.68***	-	-
FEMALE	-42.21NS	-42.21NS	-26.34NS	-85.74NS	-85.74NS	-53.48NS
AGE	-15.44***	-15.44***	-9.63**	-19.78***	-19.78***	-12.24***
INCOME	139.59***	136.59***	85.23***	145.79***	145.79***	90.94***
EDU	-124.18NS	-124.18NS	-77.49NS	4.82NS	4.82NS	3.01NS
BMI	8.02NS	8.02NS	5.00NS	21.23**	21.23**	13.24**
MARRIED	-234.54**	-234.54**	-146.36**	-133.30NS	-133.30NS	-83.15NS
EMPLOY$_{GOV}$	-380.93***	-302.56***	-191.43***	-411.39***	-373.18***	-234.12***
EMPLOY$_{PRI}$	-360.30**	-205.07*	-133.17*	-548.89***	-314.91***	-204.62***
DRINKING	-180.05**	-180.05**	-112.35**	-73.07NS	-73.07NS	-45.58NS
SMOKING	48.02NS	48.02NS	29.96NS	-237.15*	-237.15*	-147.93*
Constant	1921.1***	-	-	1218.5**	-	-
Selection model	Z	Marginal effect: WTP| ITT>0	Marginal effect: WTP| p(ITT)	Z	Marginal effect: WTP| ITT>0	Marginal effect: WTP| p(ITT)
ATT_SUC	.027***	5.82	14.78	.028***	5.05	12.47
ATT_FAI	- .008NS	- 1.68	- 4.27	- .010NS	- 2.04	- 4.62
ATT_PRO	.295***	63.45	160.93	.273***	53.40	120.96
PAST_TRYING	.051NS	11.42	28.98	.058NS	11.40	25.83
SN	.232***	49.91	126.60	.244***	47.85	108.40
Constant	-2.87***			-2.85***		
ρ	- .469***			- .43***		
σ	839.4***			828.9***		
λ	-394.0			-363.44		
log-likelihood	-3384.5			-3382.76		
Wald chi2	69.8***			95.60***		
Censored obs.	222			222		
Uncensored obs.	375			375		

Note: Marginal effects for factor levels are the discrete change from the base level and marginal effects for continuous variable are calculated at mean. The chi-square of Wald test of ρ for monthly payment is 26.4. The chi-square of Wald test of ρ for lump sum payment is 18.25. ***: significant at 1%, **: significant at 5%, *: significant at 10%, NS: non-significant. Exchange rate: THB53 = 1GBP.

Discussion and conclusion

Results of stage one of the Heckman model used to evaluate the proposed extended TOT framework corroborate Bagozzi and Warshaw (1990) findings other than

PAST_TRYING. Attitudes are powerful predictors of intention to try and willingness to pay for PNP. Attitudes and subjective norms provide useful insights for marketers and policy makers to create marketing and social strategies, which will be able to motivate consumers to make more sustainable food choices trying and willing to pay for PNP. The first stage of the Heckman model shows that not only respondents with intention were willing to pay for PNP, but also respondents with no intention with a lower probability in comparison to participant who intended to try the proposed service. Policy makers might promote scientific information concerning personalised nutrition and its benefits via public media to increase positive attitudes toward trying PNP. This strategy might indirectly influence important peers (i.e. family members, friends and partner) driving and developing intention toward PNP.

The distal components of the extended TOT also influence WTP. For example, risk averse respondents were willing to pay more for PNP because they were concerned more than risk seekers about the impact of weight and unhealthy diets on their health. This finding is consistent with results provided in other studies (Anderson and Mellor, 2008; de Oliveira et al., 2015). On the other hand, time preferences have a negative impact on WTP confirming results of Lawless et al. (2015), where they did not find any influence of risk preferences on WTP for a nutraceutical-rich juice product. High impatient individuals who cannot wait for larger return were willing to pay less for the healthy product. Furthermore, results show an interaction between type of employment and time preferences. Higher impatience was correlated with higher WTP within the employee group working for private companies. In competitive circumstances, these respondents might be more concerned about their health problem and pension after retirement. Likewise, self-employed had higher WTP than employees working for government and private companies. In Thailand, self-employed individuals do not have any public pension system and therefore, they have to take care themselves. They need valuable and sustainable food choices for their health and life security. In contrast, government officers had the lowest WTP because their health expenditures are supported by government. They have access to proper health care service and will get retirement benefits from the government pension scheme. These can be reasons why government officers are lacked in motivation for paying PNP.

According to socio-demographic and economic characteristics of respondents, results indicate that age and income influence WTP for PNP respectively negatively and positively. WTP of younger participants appears to be higher than older respondents because they probably value more the impact of obesity and related diseases and their health conditions. Moreover, the average WTP for PNP elicited via the monthly payment card was higher than for the lump sum payment. Considering probability of intention to try PNP, WTP for PNP of all participants is lower than WTP for PNP of ITT participants for both monthly payment and lump-sum payment. This is because respondents might be concerned with a large amount of extra-payment for PNP that could affect their saving or household budget because they have already other commitments. Thus, financial promotions to advertise this new technological service should provide different payment methods to attract more consumers and different WTP.

In conclusion, this study extends TOT identifying both psychological and monetary determinants of WTP for PNP. The proposed PNP provides insights for policy makers and marketers to produce sustainable food choices based on genetic and health conditions of individuals.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes,* **50**, 179-211.

Anderson, L. R. & Mellor, J. M. (2008). Predicting health behaviors with an experimental measure of risk preference. *Journal of Health Economics,* **27**, 1260-1274.

Bagozzi, R. P. & Edwards, E. A. (1998). Goal setting and goal pursuit in the regulation of body weight. *Psychology and Health,* **13**, 593-621.

Bagozzi, R. P. & Warshaw, P. R. (1990). Trying to Consume. *Journal of Consumer Research,* **17**, 127-140.

Bagozzi, R. P. & Yi, Y. (1989). The degree of intention formation as a moderator of the attitude-behavior relationship. *Social psychology quarterly*, 266-279.

Bagozzi, R. P., Yi, Y. & Baumgartner, J. (1990). The level of effort required for behaviour as a moderator of the attitude–behaviour relation. *European Journal of Social Psychology,* **20**, 45-59.

Bennett, R. M., Anderson, J. & Blaney, R. J. (2002). Moral intensity and willingness to pay concerning farm animal welfare issues and the implications for agricultural policy. *Journal of Agricultural and Environmental Ethics,* **15**, 187-202.

Chaxel, A.-S. (2016). Why, When, and How Personal Control Impacts Information Processing: A Framework. *Journal of Consumer Research,* **43**, 179-197.

de Oliveira, A. C., Leonard, T. C., Shuval, K., Skinner, C. S., Eckel, C. & Murdoch, J. C. (2015). Economic preferences and obesity among a low-income African American community. *Journal of Economic Behavior & Organization*.

Fallaize, R., Macready, A., Butler, L., Ellis, J. & Lovegrove, J. (2013). An insight into the public acceptance of nutrigenomic-based personalised nutrition. *Nutrition research reviews,* **26**, 39-48.

Heckman, J. (1974). Shadow prices, market wages, and labor supply. *Econometrica: journal of the econometric society*, 679-694.

Joost, H.-G., Gibney, M. J., Cashman, K. D., Görman, U., Hesketh, J. E., Mueller, M., van Ommen, B., Williams, C. M. & Mathers, J. C. (2007). Personalised nutrition: status and perspectives. *British journal of nutrition,* **98**, 26-31.

Lawless, L. J., Drichoutis, A., Nayga, R. M., Threlfall, R. T. & Meullenet, J.-F. (2015). Identifying Product Attributes and Consumer Attitudes that Impact Willingness to pay for a Nutraceutical-Rich Juice Product. *Journal of Sensory Studies,* **30**, 156-168.

Mann, T., Tomiyama, A. J., Westling, E., Lew, A.-M., Samuels, B. & Chatman, J. (2007). Medicare's search for effective obesity treatments: diets are not the answer. *American Psychologist,* **62**, 220.

Naylor, R. W., Droms, C. M. & Haws, K. L. (2009). Eating with a purpose: Consumer response to functional food health claims in conflicting versus complementary information environments. *Journal of Public Policy & Marketing,* **28**, 221-233.

Nocella, G., Boecker, A., Hubbard, L. & Scarpa, R. (2012). Eliciting Consumer Preferences for Certified Animal-Friendly Foods: Can Elements of the Theory

of Planned Behavior Improve Choice Experiment Analysis? *Psychology & Marketing,* **29**, 850-868.

Poínhos, R., van der Lans, I. A., Rankin, A., Fischer, A. R., Bunting, B., Kuznesof, S., Stewart-Knox, B. & Frewer, L. J. (2014). Psychological determinants of consumer acceptance of personalised nutrition in 9 European countries. *PloS one,* **9**, e110614.

Romero, M. & Biswas, D. (2016). Healthy-Left, Unhealthy-Right: Can Displaying Healthy Items to the Left (versus Right) of Unhealthy Items Nudge Healthier Choices? *Journal of Consumer Research*, ucw008.

Sabater-Grande, G. & Georgantzis, N. (2002). Accounting for risk aversion in repeated prisoners' dilemma games: An experimental test. *Journal of economic behavior & organization,* **48**, 37-50.

San-Cristobal, R., Navas-Carretero, S., Celis-Morales, C., Brennan, L., Walsh, M., Lovegrove, J. A., Daniel, H., Saris, W. H., Traczyk, I. & Manios, Y. (2015). Analysis of Dietary Pattern Impact on Weight Status for Personalised Nutrition through On-Line Advice: The Food4Me Spanish Cohort. *Nutrients,* **7**, 9523-9537.

Sheppard, B. H., Jon, H. & Warshaw, P. R. (1988). The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendations for Modifications and Future Research. *Journal of Consumer Research,* **15**, 325-343.

Sutin, A. R. (2013). Optimism, pessimism and bias in self-reported body weight among older adults. *Obesity,* **21**, E508-E511.

Thumrungsi, T. e. a. (2014). *The Report of NCDs Situation, Health and Social crisis.* 1 ed. Bangkok: Thai NCD Network.