The doctor patient relationship and adherence to medication. Empirical investigations in Greece and a game theory approach.

Charitini K. Stavropoulou

London School of Economics and Political Science

Department of Social Policy

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ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

Abstract

Non-adherence to medication is a problem of great magnitude as it leads to reduced health outcomes and increased health care costs. The impact of the doctor-patient relationship on non-adherence has attracted the interest of researchers yet relevant evidence is limited.

The aim of this thesis is twofold. It empirically investigates the relationship between the doctor-patient interaction and non-adherence to medication in Greece, on a population and a patient level. It also develops a theoretical model of the doctor-patient relationship using non-cooperative game theory to explain how supply of information under conflict conditions affects non-adherence.

Two empirical studies and a game theoretical model are used. The first study draws on data from the European Social Survey to examine beliefs about doctors and attitudes towards medication in the general population. The second study analyses a questionnaire survey of hypertensive patients in Greece, conducted for this thesis. The game theoretical approach investigates how conflicts between patients' preferences for information and doctors' effort to supply it may lead to non-adherence. It employs concepts from Behavioural Economics, which combines elements of both Economics and Psychology.

The findings demonstrate a strong association between what individuals think of doctors and their attitudes towards medication. Beliefs about doctors are the strongest predictors of non-adherence in both studies. At a population and patient level, Greeks attach a lot of weight to their doctors' opinions and adhere to their recommendations. Finally, the game-theoretical framework shows that doctors' failure to understand patients' need for information may result in patients not adhering.

The findings suggest that interventions to improve adherence rates should be built on the basis of a good doctor-patient relationship, where the doctors understand patients' needs, discuss about the treatment and pass on adequate information. The thesis is part of the cumulative knowledge in the area and could lead to further empirical and theoretical investigations.

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CHAPTER 1

INTRODUCTION

1.1 Thesis background

Health care presents a contradiction. On the one hand, advances in medicine are extending life and improving its quality, thereby providing gains of great importance for those who benefit from such advances. On the other hand, available evidence shows a great waste of resources and consequent reduction of benefits from treatments and poorer health outcomes because patients do not adhere to prescribed medication.

Adherence to a medication regimen is generally defined as "the extent to which patients take medications as prescribed by their health care providers" (Osterberg and Blaschke 2005). The World Health Organization (WHO) (2003) reports that adherence to long-term therapy for chronic illnesses in developed countries averages 50% varying by the type of condition, while in developing countries the rates are even lower given the paucity of health resources and inequities in access to health services.

Furthermore, a review of empirical studies by Pampallona et al. (2002) on the use of medication among patients with depression revealed that adherence rates varied between 32 and 82%. Even in conditions where symptoms are more severe, such as in rheumatoid arthritis, adherence to medication ranges from 43 to 84% (Brus, Van de Laar et al. 1997). Variations in adherence rates may be affected by the different methodologies or definitions employed in each study. However, regardless of these disparities one thing is certain: use of medication in many conditions, mainly chronic illnesses, is far from ideal.

The magnitude and impact of non-adherence to medications in health care is striking. Sub-optimal use of appropriate medicines results in reduced health outcomes due to relapses and re-hospitalisation. For example, untreated hypertension is known to increase the risk of coronary heart disease (Psaty, Koepsell

et al. 1990) and stroke (Marmot and Poulter 1992). As mentioned in the WHO report (2003), in the United States the cost of health care related to hypertension, its complications and comorbidities was estimated to reach 12.6% of the total health care expenditure (Hodgson and Cai 2001). Therefore, employing the cost-benefit idea, it has been argued that "increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatment" (Haynes, McDonald et al. 2002). This is particularly true for some conditions, such as hypertension. When treatment is followed appropriately it prevents patients from developing more serious and, consequently, more costly conditions, such as stroke and heart disease.

In order to suggest appropriate interventions policy makers need first to identify what the causes of non-adherence to medication are. A plethora of studies have been conducted on the issue, constituting a quite vague, and often unorganised, literature, which suggests that among the main determinants that affect patients' decisions to adhere are socio-demographic factors, disease and regimen-related factors, patient beliefs and the doctor-patient relationship.

The doctor-patient relationship remains the cornerstone of medical care and its importance in the patient's decision to adhere to medication has attracted increasing interest during the last decades. This follows a general tendency to depart from the traditional misconception that non-adherence is a patient-driven problem. Theories of doctor-patient communication such as paternalism, shared and informed decision making as well as the principal-agency theory from the field of Economics have been used to explain how this interaction affects patients' decisions. In addition, empirical studies have been looking at specific characteristics of the relationship, such as decision making, supply of information, verbal and non-verbal behaviour as well as the agendas that the two parties bring to the consultation.

Yet, the doctor-patient relationship is a highly complex and multifaceted issue. Many aspects of this relationship remain unknown or unexplored and the impact on the patient's decision needs to be examined further.

1.2 Research focus

The broad objective of this thesis is to examine the issue of non-adherence to medication with a particular focus on the effect that the doctor-patient relationship has on a patient's decision to follow medical recommendations or not.

The first aim of the thesis is to empirically examine the impact of the doctor-patient relationship on non-adherence to medication in Greece, a country where no previous evidence on the issue exists. Two research aims were developed. The first aim was to set the issue of non-adherence in the broad country context looking at the general population level. Most of the empirical evidence on the topic of non-adherence focuses on a specific disease group, as a result of which evidence on the general population's beliefs and attitudes is very limited. Data from the second round of the European Social Survey facilitate this aim. The survey allows not only the examination of the issue of non-adherence on the general population level in Greece but it also permits cross-country comparisons, filling another gap in the literature.

The second part of the empirical investigation tests the impact of the doctor-patient relationship on non-adherence to medication among a specific group of Greek patients. A questionnaire survey was planned to meet this second aim. Current theoretical elements used in the literature, as well as empirical studies in similar settings, were partly the basis of this questionnaire survey. Its objective was to collect detailed information on Greek patients' attitudes where no previous systematic evidence exists.

As the research evolved, the need for a new formal and more coherent model became apparent. A careful review of existing theoretical models and empirical literature as well as findings from the two empirical studies of the thesis identified theoretical gaps. There is strong empirical evidence suggesting that the doctor and the patient go into the consultation with differing agendas and purposes, which often lead to sub-optimal results, such as non-adherence to medication. However, all the existing theoretical models referred above explain successfully some aspects of the relationship, but they fail to capture these conflicts clearly. This gave rise to the need for a better theoretical understanding of doctor-patient communication and its

impact on the patient's decision to non-adhere. For this aim we developed a model based on a game theoretical framework.

The aims of the thesis described here, along with the specific research hypotheses and questions, will be explained in more detail in Chapter 3.

1.3 Outline of the thesis

This thesis is organised into seven more chapters. Chapter 2 is a review of the literature in the area. It begins by clarifying the concepts and definitions used to describe a patient's departure from a doctor's recommendations. It then presents the theoretical models which have been used to explain non-adherence in general as well as the main theoretical frameworks of doctor-patient communication that explain how this relationship impacts on patients' decisions. We find that it is more convenient to explore the theoretical background before we present the empirical evidence. A review of the empirical literature follows, presenting the studies that have been conducted to date to identify factors associated with non-adherence to medication, paying particular attention to the doctor-patient relationship. Finally, given that the focus of the thesis has been the situation in Greece, a brief overview of the country's health profile as well as the organisation of the Greek health system is presented.

Having identified the literature gaps and limitations, Chapter 3 states the conceptual framework for the thesis followed by the specific research questions and hypotheses. A brief section presents the basic methodology used to address these research questions, although a more detailed analytic methodology section is included in each of the three main parts of the thesis.

Chapter 4 presents the first of the two empirical studies of the thesis. It analyses data from the European Social Survey in order to examine the issue of non-adherence to medication and the doctor-patient relationship at a population level. Results are discussed in two ways. First, the general beliefs that the population in Greece has about doctors' role and their attitudes towards medication are examined and compared to those of other Europeans to identify idiosyncratic differences. Then, the

analysis identifies the determinants of the general population's attitudes towards prescribed medication with a specific focus on how the perceptions that people have of doctors impact on these attitudes.

In Chapter 5, the thesis examines in depth the issue of non-adherence in a specific group of hypertensive patients in Greece. It presents the methodology of the survey, explaining the development of the questionnaire and the fieldwork in Greece. The study builds upon the existing theoretical elements and empirical studies. It intends to identify the factors that affect non-adherence to medication, focusing on the perceptions that patients have of the doctors they consult for the treatment of hypertension. Results shed light on what Greek patients think of their doctors and how this impacts on their decision to take medication as prescribed.

Chapter 6 is the theoretical part of the thesis. We begin with a review of the models of the doctor-patient relationship that come both from the field of medical literature and the recently evolving field of Behavioural Economics, which combines elements from Psychology and Economics. This chapter challenges existing models on the grounds that they fail to capture the conflicts which, the medical literature argues, exist in the consultation and may lead patients to non-adhere to recommendations. It then presents the non-cooperative game theoretical models that focus on the supply of information by the doctor. The chapter intends to examine how the doctor's failure to understand differences in patient preferences for information may lead a patient to avoid following recommendations. It presents, under specific but reasonable assumptions, a complete resolution of the models obtaining results based on the doctor's effort and the patient's preference for information.

Chapter 7 provides an overall discussion of the results of the thesis and considers the policy implications. It brings together the results from the two empirical chapters in order to shed light on the issue of the doctor-patient relationship and non-adherence in Greece. It then discusses the findings of the game theoretical chapter and connects them to the empirical ones of the previous chapters. Policy implications are primarily discussed for Greece. However, more general implications are derived from the game theoretical model and are discussed with respect to the doctor, the patient and administrative support concerning the issue of non-adherence. The

chapter concludes by providing possible directions for future investigations in the area, as research is an ongoing process.

Finally, Chapter 8 brings together all the chapters of the thesis and summarises the key points.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the existing empirical and theoretical background of the issue of non-adherence and the doctor-patient relationship. It begins with a clarification of the main concepts and definitions, elucidating the differences in the terms used to describe a patient's departure from the doctor's recommendations. It continues with a critical review of the main theoretical models that are presented here in two clusters: models that are used to explain non-adherence, as a health behaviour chosen by the individual, and models of doctor-patient relationships that explain how this interaction affects a patient's decision to non-adhere.

The exploration of the theoretical models is followed by a review of the empirical studies that have been conducted in this area to identify determinants of non-adherence. Finally, given that the focus of the empirical surveys of this thesis is Greece, a brief review of the health profile and the health system of this country is provided at the end of the chapter.

2.2 Concepts and definitions

This section reviews the terms used in the area and gives appropriate definitions. It then discusses different types of adherence that are met in the literature.

2.2.1 Terms and definitions

There is no single, commonly accepted term used to describe a patient's departure from the doctor's treatment recommendations. The relevant literature uses the terms non-compliance, non-adherence and lack of concordance. Although they are often used by some authors interchangeably, each of these terms has a different meaning and therefore different implications.

Compliance

Early studies in this area used the term compliance. Haynes et al. (1979) give one of the first definitions of compliance, which has been widely adopted by many authors, that is "the extent to which a person's behaviour (in terms of taking medication, following a diet, modifying habits or attending clinics) coincides with medical or health advice".

This is a general definition that focuses not only on compliance to medication, but also goes beyond prescribed pharmaceuticals to other health-related behaviours such as exercising, following a diet, etc. However, the term compliance has often been conceptualised as obedience; that is, the physician prescribes and the patient obeys (Dunbar-Jacob and Serein 2001). This concept implies that the patient is a passive participant who executes certain behaviour because s/he is made by the physician to do so and not because s/he actively decides to. This potential problem is noted by Haynes himself when he comments that "the term compliance is troublesome to many people because it conjures up images of patient or client sin or serfdom" (Haynes 2001). To avoid the concept of obedience, researchers began using alternative terms that give a more active role to the patient in the decision making process.

Adherence

The term adherence was one of the first alternatives to compliance and quickly became widely accepted by researchers and healthcare providers as a departure from the notion of obedience while also removing the implied guilt of the patient. Rand (1993) defines adherence as "the extent to which a patient's behaviour corresponds to the physician's therapeutic recommendations". This definition is quite similar to the definition used by Haynes et al. (1979) but allows patients to *correspond* to doctor's suggestions. The active role of the patient is more obvious in this definition and the final decision requires agreement between the two parties.

The World Health Organization (2003) combines Haynes' and Rand's definitions and arrives at the following approach: "adherence is the extent to which a person's

behaviour - taking medication, following a diet, and/or executing lifestyle changes - corresponds with agreed recommendations from the health care provider".

Again, the role of the patient as an active decision maker is increased as the definition allows the patient to agree with the healthcare provider's recommendations. The WHO definition replaced an earlier version given at the WHO Adherence meeting in June 2001 at which adherence was "the extent to which the patient follows medical instructions" (Sabate 2001).

In general, the term adherence clearly gives a more active role to the patient than the term compliance does. It allows the patient to be free in choosing the right recommendation and it emphasises the need for agreement between the doctor and the patient.

Concordance

Another term used in the literature is that of concordance. This newer concept of doctor-patient communication began in the UK with a report by the Royal Pharmaceutical Society of Great Britain (henceforth RPSGB) (1997). It was later extensively discussed in a review by Cox e al. (2004) of the communication between patients and health care professional published by the RPSGB. There is no precise definition of concordance and the last RPSGB review refers to it in a descriptive way as follows:

> "the clinical encounter is concerned with two sets of contrasted but equally cogent health beliefs – that of patient and that of the doctor. The task of the patient is to convey her or his health beliefs to the doctor; and of the doctor, to enable this to happen. The task of the doctor or other prescriber is to convey his or her (professionally informed) health beliefs to the patient; and of the patient, to entertain these. The intention is to assist the patient to make as informed a choice as possible about the diagnosis and treatment about benefit and risk and to take full part in a therapeutic alliance. Although reciprocal, this is an alliance in which health care professionals recognise the primacy of the patient's decisions about taking the recommended medications" (Cox, Stevenson et al. 2004).

Concordance is therefore a concept which suggests frank exchange of information, negotiation, and a spirit of cooperation between the patient and doctor (Mullen 1997). Mullen (1997) argues that conditions in Britain, compared to the US, favour this approach; since "patients and practitioners are more likely to have known one another for longer, dispensing medical care is less impersonal and ancillary personnel are available for a follow up".

Confusion in the use of terms

There are ongoing discussions on which term (compliance, adherence, concordance) is more appropriate. Haynes (2001) in a recent paper argues that perhaps 'acceptance' would be the best term of all; however, it is not widely used. 'Compliance' remains the most widely cited term and produces the greatest yield in literature searches, but it is 'adherence' that seems to have been more often chosen by researchers in recent years.

It is important, however, to make a clear distinction between the terms 'adherence', 'compliance' and 'concordance', which are often confused and misunderstood. The term 'concordance' refers to the communication between the patient and the doctor during the consultation, while 'adherence' and 'compliance', despite the conceptual differences in the way they perceive a patient's role in the decision making process, both refer to the patient's behaviour. A patient can be non-compliant or non-adherent, but cannot be non-concordant by definition. Yet, lack of concordance during consultation may lead to non-adherence to recommendations. It is, therefore, incorrect to use the term 'concordance' to describe patient behaviour, and hence it is erroneous to use it interchangeably with the terms 'compliance' and 'adherence'.

In this thesis, the term 'adherence' is used to describe patient departure from the physician's recommendations because it acknowledges the patient as an active participant in the decision-making process and not as a passive individual who simply obeys the doctor's instructions. 'Concordance' refers to the process rather than the patient's behaviour and as such it is not the appropriate term for the purpose of this thesis. 'Adherence' is also the term used by the WHO in the 2003 report on long-term conditions (WHO 2003). In addition, a report for the National Co-ordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO)

written by a group of experts in the field and commissioned by the National Institute for Clinical Excellence (NICE) also recommends 'adherence' as the term of choice to describe patients' behaviour (Horne, Weinman et al. 2005). The same report also concludes that 'concordance' is a more complex and less clearly defined term that should not be used to describe patients' medication-taking behaviour as it relates to the process and outcomes of prescribing (rather than patient behaviour).

It is important to mention at this point that in the literature review section of this thesis the terms 'compliance' and 'adherence' will be used interchangeably, reflecting simply the authors' choice of term.

2.2.2 Types of adherence

It is necessary to distinguish between different types of adherence. Schlenk et al. (2001) define the following types, varying according to patients' intention to follow recommendations:

- *Erratic non-adherence*: In this case, patients come to an agreement with their physicians and they know what to do but they end up not following the therapy because they find it difficult or complicated or simply because disruptions interfere with following the regimen.
- *Unwitting non-adherence*: Patients incorrectly follow the prescription because of a misunderstanding, incorrect administration technique, language barriers or cognitive impairment. A striking point about this type of non-compliance is that neither the doctor nor the patient recognises the problem.
- *Intentional non-adherence (or 'intelligent non-adherence')*: The patient decides to change or discontinue the therapy although it may not be wise to do so. This may happen because the patient feels better, s/he thinks that the medication is no longer needed, the drug has side effects or there is a fear of addiction. Patients usually do not report non-compliance in this case because the doctor may judge it negatively.

Another distinction in non-adherence refers to the type of departure from recommendations. According to this two types are identified: primary and secondary non-adherence.

- *Primary non-adherence* refers to the prescription not being dispensed in the first place (Beardon, McGilchrist et al. 1993). This type of non-adherence is particularly

interesting as it is often associated with the costs of the prescriptions. Socioeconomic disadvantage may be a factor in explaining patients' decisions (Wamala, Merlo et al. 2007).

- *Secondary non-adherence* refers to situations in which the patients dispense the prescription but do not follow it as recommended by the health care provider. This type of non-adherence can take various forms, including sub-optimal dosing, taking the right doses but not at the right time, not taking medication for some periods, such as during holidays, or completely stopping the medication.

Different types of non-adherence may have different determinants. However, it is not always easy to distinguish between these different types. This thesis is primarily examining a patient's intentional decision to non-adhere to recommendation. However, it acknowledges the fact that in some cases the distinction may be blurred. This is clearly stated where it occurs.

2.3 Review of the theoretical models

By theoretical models we mean various attempts and constructions to advance relevant hypotheses in order to provide a deeper understanding and explanation of behaviour. They illuminate particular aspects, they vary in their conception and generality with the various authors and they do not always take the form of a formal structure.

This section explores the existing theoretical models that have been used in the area of the doctor-patient relationship and non-adherence. Review of the theory is completed in two stages. The first half of this section considers the theoretical models used to explain non-adherence to medication as a behaviour chosen by a patient. The second half examiners the models on the doctor-patient relationship with a particular interest in how such models attempt to explain a patient's decision to non-adhere.

2.3.1 Theoretical models on adherence

Several theoretical models have been developed to explain how people initiate and maintain actions to preserve health status. Leventhal (1993) distinguishes between

psychological and social theories. Psychological theories suggest there can be a match between prescribed standards for health behaviour and actual or observed behaviours of the patient. Sociological theories present compliance as a hierarchical social system in which the practitioner's role is to provide diagnosis and a treatment regimen and the patient's role is to listen and follow instructions.

Early studies on compliance were atheoretical and were based on the assumption that any departure from the doctor's instructions was the patient's fault. They attempted to find characteristics that would form a typical non-adherent patient. Researchers soon realised that a patient's personality cannot be seen separately from the environment or the treatment s/he follows. As a consequence new models included environmental cues that elicit behaviour, such as follow-up phone calls, reminders etc. Nevertheless, even these studies failed to provide a comprehensive understanding of the problem, and under situational changes did not produce the same outcomes.

It soon became clear that examining the demographic characteristics of a typical non-adherent and creating special environments to control patients' behaviour was not enough to resolve the problem, and as a result researchers started using cognitive behavioural models. The most commonly used models attempting to analyse the problem of non-adherence to medication in chronic diseases are the social learning models, i.e. the model of self-efficacy, and the cognitive models, i.e. the Health Belief Model, the Theory of Reasoned Action, the Theory of Planned Behaviour, and the more recent Self-regulatory Model. We start with the cognitive models as being the first models which have been used to explain adherence.

2.3.1.1 The Health Belief Model

The Health Belief Model (HBM) was developed by Rosenstock (1966; 1974). In its general form it consists of two aspects of individuals' representations of health and health behaviour. The first is *threat perception,* which further consists of two aspects: perceived susceptibility to illness and perceived severity of its consequences. Perceived susceptibility refers to the subjective risks of contracting a condition and varies widely among individuals. The perceived seriousness refers to the degree of emotional arousal created by the thought of the disease but also all the

difficulties a given health problem may create to the individual. The second aspect is *behavioural evaluation,* which also has two components: the benefits of a recommended health behaviour, i.e. how beneficial s/he thinks the treatment is, and the costs of or barriers to enacting the behaviour, consisting of monetary or convenience factors.

In other words, patients seem to adhere more if they believe themselves to be susceptible to a particular condition, which they also consider to be serious, and they believe that the benefits of the action taken to counteract the health threat outweigh the costs (Sheeran and Abraham 1996). Later additions to the model are the *cues to action*, i.e. social influence and health promotion campaigns, as well as an individual's general *health motivation* (Becker, Haefner et al. 1977). All of the above aspects are presented in Figure 2.1.

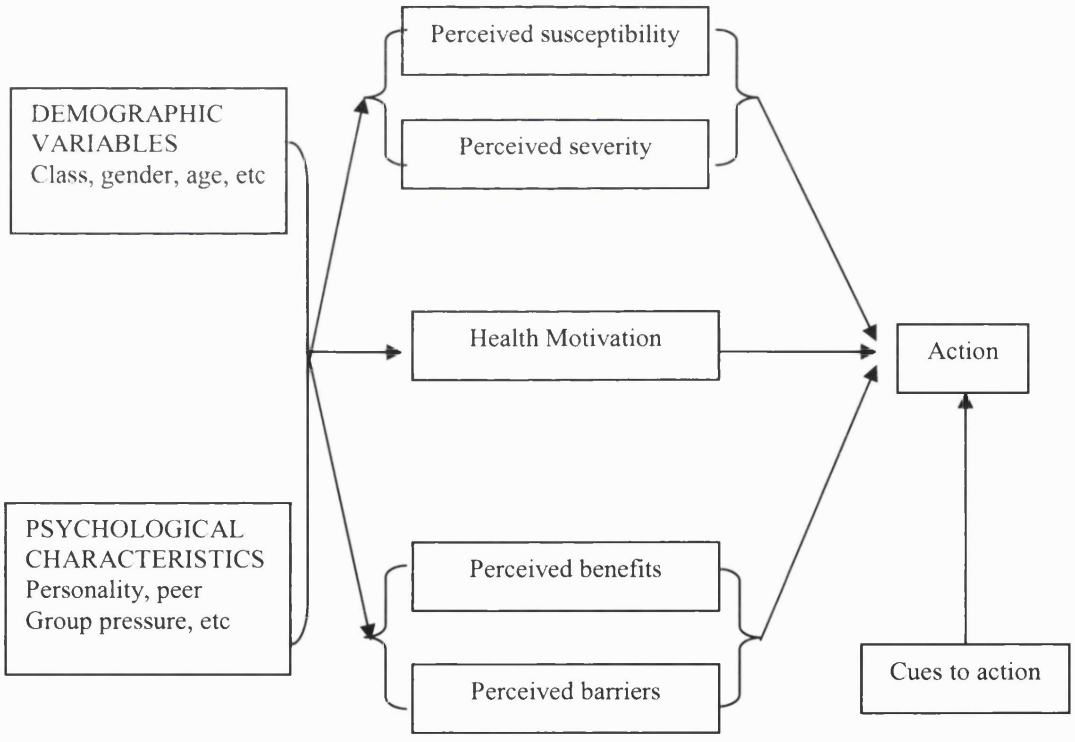


Figure 2.1: The Health Belief Model, (*taken from Shreeran and Abraham (1996)*).

The Health Belief Model has received great attention from researchers and has been tested in many disease groups to explain adherence to medication. These include application of the model in hypertension (Nelson, Stason et al. 1978; Taylor 1979),

diabetes (Harris and Linn 1985; Bradley, Gamsu et al. 1987) and psychiatric disorders (Budd, Hughes et al. 1996).

Despite its popularity the Health Belief Model (HBM) is not without limitations. It appears to exclude some important variables which in other models receive greater attention, such as intentions to perform an action (Theory of Reasoned Action and Theory of Planned Behaviour) or perception of the control over the performance of the behaviour (self-efficacy model). Rosenstock (1974) did not really specify how different beliefs influence one another. He also gave no operational definitions of the variables, and therefore researchers use different methods. For example, perceived vulnerability is used by some researchers to measure personal vulnerability to a specific health threat and by others general vulnerability to disease relative to other people (Rutter and Quine 2002).

Further criticisms of the model include its emphasis on the individual, i.e. it does not explain sufficiently the role of the social environment, and the absence of a role for emotional factors such as fear and denial (Ogden 1996). Finally, the HBM has been criticised for being a static representation of human behaviour in which beliefs are described as occurring simultaneously with no space for change or progress (Schwarzer 1992). Therefore, there are concerns on whether the model could predict non-adherence to medication, the nature of which is more dynamic.

2.3.1.2 Theory of Reasoned Action and Planned Behaviour

In this section, the Theory of Reasoned Action (henceforth TRA) and the Theory of Planned Behaviour (henceforth TPB) are presented together, since the latter is an extension of the former. The TRA was originally developed by Ajzen and Fishbein (1980) to explain the relationships between attitudes and behaviour and was later widely used to predict health behaviour. The central idea is that intention precedes and predicts behaviour. Intention is determined by two factors: attitudes towards a behaviour and subjective norms.

According to the TRA, attitudes toward a specific behaviour are determined by salient beliefs, called behavioural beliefs and the individual's evaluation of the outcomes of this particular behaviour. The evaluation of each outcome contributes to

the attitude in proportion to the person's subjective belief that this behaviour will produce the result in question. Therefore, multiplying beliefs and outcome evaluation and summing up the results give an estimate of the attitude towards behaviour. In a similar way, subjective norms are a function of normative beliefs, i.e. the individual's beliefs that others approve or disapprove of his/her behaviour, and his/her motivation to comply.

Azjen soon realised that intention alone is not enough to predict behaviour. Therefore, a few years later a new component was added to the TRA to formulate the Theory of Planned Behaviour (Ajzen 1985). This is the perceived behavioural control that describes the extent to which the individual believes that behaving in a certain way is something that is under his/her control. The more opportunities individuals think they have and the fewer obstacles they anticipate, the greater their perceived control over the behaviour (Ajzen 1991). A graphical representation of the model of the Theory of Reasoned Action and Planned Behaviour (new components are shaded in grey) is provided in Figure 2.2.

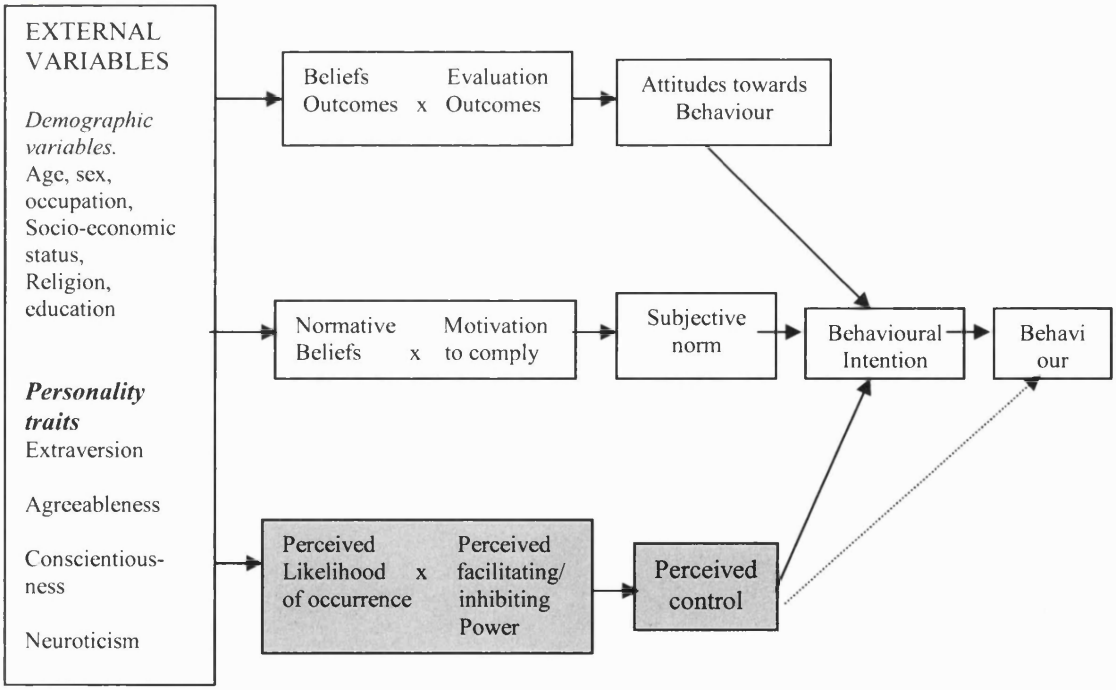


Figure 2.2: The Theory of Reasoned Action and Planned Behaviour (*taken from Conner and Sparks (1996) and Rutter and Quine (2002)).*

The model has been used in a large number of studies predicting health behaviours such as smoking initiation, alcohol consumption, sexual behaviours and exercise (Rutter and Quine 2002). Some of its components have also been used to predict patients' drug compliance (Hounsa, Godin et al. 1993).

The criticisms of the model focus mainly on its applicability. The TPB, as was the case with the HBM, is a model with static character. Ajzen (1985) reports that "since the likelihood of unforeseen events will tend to increase as time passes, we would expect to find stronger intention-behaviour correlations with short rather than long periods of delay".

In other words, the model could be used to predict short-term adherence to medication but is not adequate to give a better understanding of non-adherence in chronic diseases. In addition, a great deal of criticism focuses on the fact that the model deals with the perception of control and not with the actual control issues themselves (Conner and Sparks 1996).

2.3.1.3 The Self-Efficacy Model

A similar concept to the perception of control in the Theory of Planned Behaviour is the notion of self-efficacy. It argues that a strong sense of personal efficacy is related to better health, higher achievement and more social integration. This concept was originally developed within Bandura's (1977) Social Cognitive Theory. It was based on the hypothesis that expectations of personal efficacy determine whether coping behaviour will be initiated, how much effort will be expended and how long it will be sustained in the face of obstacles and averse experiences.

Four sources of information are associated with the expectations of personal efficacy according to the model: performance accomplishments, vicarious experience, verbal persuasion and psychological states.

- *Performance accomplishments*: This is based on individuals' personal experiences. Past successes raise expectations while repeated failures lower them.
- *Vicarious experience*: People are influenced not only by their own experiences but also by those of other people. If they see other people behaving in a particular manner they persuade themselves that if others can do it, they should be able to do

it as well. However, Bandura (1977) argues that vicarious experience is not as strong a source of information as performance accomplishments.

- *Verbal persuasion.* People are led, through suggestion, into believing that they can perform in a particular way, which they could not do in the past. This is a popular way of influencing human behaviour because it is simple and easy.
- *Emotional arousal.* Some situations, such as stress, which elicit emotional arousal, may have informative value concerning personal competency. Consequently, emotional arousal is a source of information that may affect perceived self-efficacy in coping with threatening situations.

Although the concept of self-efficacy was developed by Bandura, it has meanwhile proven to be an essential component in all major models. In the Health Belief Model it is presented as 'barriers' to action. Ajzen (1991) has extended the Theory of Reasoned Action to the Theory of Planned Behaviour by adding 'the perceived behavioural control'. Therefore 'self-efficacy models' are no longer distinct from other approaches (Schwarzer and Fuchs 1996).

2.3.1.4 The Stages of Change Model

Thus far, all the models presented deal with the performance of a particular behaviour at a specific point of time. Therefore they may be useful for the prediction of human behaviour in the short term but they fail to explain long-term behaviour such as adherence to chronic illnesses. The Stages of Change Model intends to overcome the problem of the static character of the previous models. It suggests that health behaviour develops in five progressive stages of change:

- *Pre-contemplation.* In this stage the individual has no intention of changing behaviour and seems unaware of the benefits of such a change and resistant to efforts to modify it.
- *Contemplation.* The individual has begun to think about modifying his behaviour but has made no commitment to change.
- *Preparation.* This is the stage of decision-making; a commitment to change has been made. The person has started changing his/her attitude in some ways.
- *Action.* Efforts to change occur. The individual makes important changes in his/her behaviour but these are not yet fully established.

- *Maintenance.* Individuals try to stabilize their behaviour, change and avoid relapse.

The model has been applied in chronic conditions such as smoking (Prochaska and DiClemente 1983), as well as applications in adherence to medication intended to explain and predict changes in behaviour and also to suggest different intervention policies depending on which stage the patient is at (Willey, Redding et al. 2000).

One of the limitations of the model is that there is no clear evidence of how motivation to continue with the health behaviour is maintained (Horne and Weiman 1998). A great deal of criticism has to do with whether the person passes through stages or whether these stages are just points of a continuum. It is also questioned whether people have to pass through every stage or if they can miss one, and whether all people face the same barriers at every stage. All these questions remain open to debate.

2.3.1.5 The Self-regulatory Model

Another dynamic approach is given by Leventhal (1993), who tries to explain the dynamic interaction between cognitions and behaviour while taking into consideration the notion of motivation. His model, known as Leventhal's Self-Regulatory Model, is based on the idea that the patient is an active problem solver and that health behaviour is an effort to fill the gap between current health status and a future state. Leventhal argues that previous researchers have placed too much emphasis on concepts such as self-efficacy and behavioural skills and little, or no, attention to the notion of maintaining motivation for change. His self-regulation model is presented in Figure 2.3.

The model suggests that there are three basic stages in the process of adapting a behaviour. First, based on internal and external stimuli, the individual generates representations of both his/her disease threats, e.g. danger, and emotions, e.g. fear. This representation helps the person define his/her goals and cope with the situation in a particular way. The third stage is appraisal of the coping outcomes. The appraisal depends on the expectations about the effectiveness of the coping response and the nature of the representation (e.g. is the symptom a sign of a transient or a serious, chronic condition?).

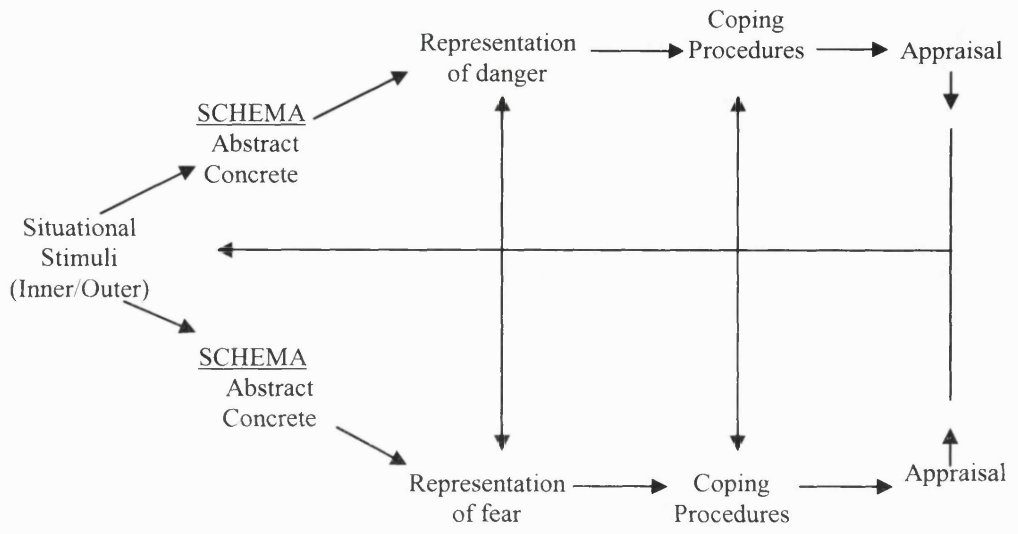


Figure 2.3: Parallel Processing Model for adaptation to health threats (*taken from Leventhal (1993)*).

Appraisals update the representation and change the identity of the problem and its controllability. They also change expectations respecting the effectiveness of the coping procedure. Not shown but also appraised is the individual's perception of his/her effectiveness in performing these actions, and his/her perceptions of the effectiveness of the support system, both expert and non-expert.

The self-regulatory model has achieved a great deal of attention and has been used by researchers to explain adherence to medication in chronic illnesses mainly because of its dynamic character. Horne et al. (1999) have developed their Beliefs about Medicines Questionnaire (BMQ) based on this model. The BMQ has been used extensively in many empirical studies as it provides useful insights into the way patients think in general about medicines and in particular about the medicines they are prescribed (Horne, Weinman et al. 1999; Svarstad, Chewning et al. 1999). These beliefs have been shown to be significant predictors of non-adherence. However, the questionnaire focuses on beliefs about medicines and does not take into account the impact of the doctor, therefore it was not very useful for the purposes of this thesis.

2.3.1.6 Discussion

There is no model or concept that perfectly explains health behaviour in general and non-adherence to medication more specifically. However, despite their limitations the models mentioned above provide valuable information to researchers in understanding patients' behaviours. This thesis will use certain concepts that appear in some, or sometimes in all, of the models. These concepts are:

- *Self-efficacy and perceived control.* This is the patient's belief that behaving in a certain way is under his/her control. These concepts appear in the majority of the models.
- *Beliefs about health outcomes.* This appears as behavioural evaluation in the Health Belief Model (benefits against costs or barriers of taking medication) and it is also similar to the idea of the attitudes towards behaviour, i.e. beliefs about outcomes and evaluation of the outcomes that is included in the Theory of Planned Behaviour.
- *Beliefs about the illness.* In the Health Belief Model this is mentioned as threat perception (perceived susceptibility to illness and perceived severity of its consequences).
- *Motivation.* This is mainly mentioned in the Self-regulatory model and gives the patient an active role in the issue of non-adherence.
- *Anticipation.* A number of the models include the notion of anticipation, especially when models refer to evaluation of outcomes for the future. Leventhal's Self-Regulatory Model in particular, as mentioned above, is based on the idea that the patient is an active problem solver and that health behaviour is an effort to fill the gap between current health status and a future ideal state. Indeed patients very often need to decide in the present on whether to take an action for future health outcomes.

These theoretical elements will be useful components for the two empirical studies presented in Chapters 4 and 5 of this thesis. Both the secondary analysis of the European Social Survey and the analysis of the questionnaire survey in Greece intend to identify the determinants of non-adherence to medication and elements of self-efficacy, motivation and beliefs about health outcomes and illness, will be further investigated. The game theoretical framework discussed in Chapter 6 also

uses some of the above elements, placing particular emphasis on the notion of anticipatory feelings. Anticipation lies at the heart of the Psychological Expected Utility (PEU) theory, developed by Caplin and Leahy (2001), upon which the game is built.

Having reviewed the models that have been developed to understand individuals' health decisions in general and non-adherence in particular, it is now important to review the models of the doctor-patient relationship and examine how they explain the impact that this interaction has on a patient's decision to follow recommendations.

2.3.2 Theories on the doctor-patient relationship

The doctor-patient relationship remains the cornerstone of medical practice. At the same time it is one of the most complex interactions in health care, which goes beyond consultation and clinical practice and involves aspects that are developed outside the encounter. Constructing a theory, therefore, that captures all aspects of this interaction is a very difficult task.

However, theorists narrow down the breadth of this relationship by developing models on some aspects of it, such as the decision-making process and communication at the consultation level. Hence, it is often seen that the terms 'relationship' and 'communication' are used interchangeably although the latter term mainly refers to the consultation, involving information exchange, verbal and non-verbal behaviour, while the former is more a general and broad term.

In this section, the main doctor-patient decision-making models are presented, followed by a more general model developed by Ong et al. (1995), which aims to put the doctor-patient relationship into a broad framework that connects communication with background variables and patient outcomes. All these models are examined and critiqued on the basis of how they explain non-adherence to recommendations.

There is no clear agreement on how to categorise the models used to describe the doctor-patient relationship with regard to decision making. In fact, there is considerable overlap and the models are often confusing to the reader. Here, they are

presented according to the respective role that the doctor and the patient take in the final selection of treatment, as this will help in examining associations with adherence to recommendations. The categorisation by Charles et al. (1999), which includes three main models (paternalism, shared and informed decision making) as well as a fourth model derived from Health Economics (the principal-agency theory), is followed below.

2.3.2.1 Paternalism

This is the traditional model of the doctor-patient relationship, in which the doctor, as the expert, diagnoses the patient and decides on the appropriate treatment. In this model the patient has a passive role and no active involvement in the decision-making process. It is this passive role that associates the paternalistic model with 'compliance', where the doctor decides and the patient obeys. Coulter (2002) avoids the term 'paternalistic' and calls this model 'professional choice', arguing that it may be appropriate under some circumstances for the doctor to make decisions without the patient being actively involved.

2.3.2.2 Shared decision model

This model was developed by Charles et al. (1997), who argue that there should be four specific characteristics for shared decision making to be effective:

1. Both the physician and patient are, to some extent, involved in the treatment decision-making process.
2. Both parts share information.
3. Both take steps to participate in the decision-making process by expressing treatment preferences.
4. A treatment decision is made and both the physician and the patient agree on the treatment to be adopted.

In this framework, both the patient and the doctor are active members in the decision making process and therefore this model is closer to the concept of 'concordance'. However, in terms of the patient's behaviour the model allows for active choice, and as such it is also compatible with the concept of 'adherence'. However, a study by

Stevenson et al. (2000) of 62 consultations in Britain along with interviews with patients and general practitioners revealed that there is little evidence that patients and doctors both participate in the consultation in this way. The study concluded that even the first two of the four components that are necessary for the shared decision making to be upheld, i.e. for both parts to be involved and exchange information, were not present in the consultations which were studied.

2.3.2.3 Informed decision making model

The informed decision making model is often presented together with the shared decision making model (Britten and Weiss 2004) as both indicate a reaction to the model of paternalism. However, Charles et al. (1999) argue that the two models have essential differences which are mainly concerned with the information exchange. In the shared decision model the flow of information is two-sided as both the patient and the doctor exchange information, the latter mainly on the medical level and the former more on the personal level, such as experience and preferences.

In the informed decision making model the information is mainly one-sided, with the doctor supplying the information to the patient, mainly regarding medical aspects. Also, in the shared decision model the final decision is a common agreement between the two parties while in the informed model it is the patient who decides. In that sense, the informed model is closer to the concept of adherence as it gives an active role to the patient by allowing the final decision to be taken by the patient, who is well informed by the doctor.

A similar concept to that of the informed model is the informed consent decision-making model (Wirtz, Cribb et al. 2006). In a similar way, the patient has the final decision-making role but gives the doctor the authority to do so for him/her. Yet, there are two differences between these two models. The first one is that informed consent is a form of legal authorisation, and for this to be valid certain criteria need to be met, such as the patient's understanding of the information disclosed and freedom from coercion or manipulation by the doctor. Also, informed consent does not necessitate the patient to choose from a range of options but usually the doctor requires permission relating to one health care intervention, while informing the patient about other options.

The distinctions between the models described above are clear in Figure 2.4 taken from Charles at al. (1999). In Figure 2.4, all the models along with their main characteristics regarding information exchange, deliberation and decision on treatment are presented. As mentioned in this figure, there are also models of the doctor-patient relationship that stand between the three models presented but a reference is avoided here for the purposes of clarity and simplicity.

Analytical Stages		**Paternalistic**	**(in between approaches)**	**Shared**	**(in between approaches)**	**Informed**
Information exchange	Flow	One way (largely)		Two way		One way (largely)
	Direction	From physician to patient		Physician to and from patient		From physician to patient
	Type	Medical		Medical and personal		Medical
	Amount*	Minimum, legally required		All relevant for decision-making		All relevant for decision-making
Deliberation		Physician alone with other physicians		Physician and patient (plus potential others)		Patient (plus potential others)
Deciding on treatment to implement		Physicians		Physician and patient		Patient
**Minimum required						

Figure 2.4: Models of doctor-patient relationship, (*taken from Charles et al. (1999)*).

2.3.2.4 Principal-agent model

In Health Economics the doctor-patient relationship is often perceived as an agency one. The principal-agent model stresses the information asymmetry between the physician and the patient introduced by Arrow (1963). It states that the doctor acts like an agent maximizing the patient's, i.e. the principal's, utility. The doctor holds more information about the patient's health status and the available treatments. The patient has superior knowledge about how these treatments fit with his lifestyle and

has specific beliefs about medication and illness. The patient communicates these preferences to the doctor, who then acts as an agent for the patient.

In the perfect agency model, a specific case of the principal-agent theory, the doctor maximizes the patient's utility as if it were his own.[1] This model is not without limitations and criticisms. Empirical evidence has extensively shown that the doctor and the patient bring to the consultation different agendas and that the doctor is very often unable to understand patient needs (Britten, Stevenson et al. 2000). When these needs are not met the outcomes of the consultation are unsatisfactory and patients may non-adhere to the doctor's recommendations. It also seems unrealistic for the perfect agency model to work in practice as the doctor, apart from the patient's needs, has other constraints that need to be taken into consideration, such as administrative constraints, time issues and personal benefits and costs.

Departing from the perfect-agency model, there is an extensive literature on how physicians can act beyond maximising the patient's utility function only. The review by McGuire (2000) of the theory and empirical research on physicians' motivation presents three ways a physician can influence the quantity of medical care the patient can buy: non-retradability, which allows quantity setting, choice of non-contractible input and the supply-induced demand.

Specifically, the notion of physician-induced demand has been used widely in the doctor-patient literature and it has been used to explain why doctors lead the patient to consume more than if they had perfect information (Evans 1974). The model focuses on the supply-side of medical care and explains how doctors make patients consume more or less than if they had perfect information about their treatment. Yet it does not explain why patients may fail to follow recommendations.

Scott (2000) reviews the model of GP behaviour, which, as he argues, may be generalisable to physicians in general, and notes that there is no single common utility function used, but different studies use different arguments in the doctor's

[1] Gafni et al. (1998) argue that an alternative to the perfect agency relationship would be for the doctors to pass the information to the patients, who now being perfectly informed and knowing their own preferences can choose what is the best option for them. This makes the model conceptually identical to the informed model of decision making and as Gafni et al. (1998) argue it seems to be "superior to the model of the physician being a perfect agent in terms of feasibility of implementation".

utility. The income-leisure framework is common to many models, while workload is another element. Scott argues that the latter "is likely to have arisen directly from the principal-agent theory where 'effort' (or the actions of the agent) is assumed to be negatively related to utility".

The altruistic element is also often found in the models mentioned in the review (Scott 2000). Some models incorporate this by including patient's utility or welfare in the GP's utility function, while others include patient's economic well being and the interests of society as arguments in his utility (Blomqvist 1991; Kristiansen 1994).

It is shown from the above that Economic models allow doctors' behaviour to be driven not only by altruistic elements but also other aspects such as workload, income, reputation and other non-altruistic factors.

Le Grand (2006) describes these two different aspects of doctor behaviour as knightly and knavish and argues that it is "perfectly possible for someone to be both a knight and a knave: that is, to have altruistic motivations for some of his activities or behaviour and self-interested ones for others". In addition, he has argued that it is not only financial considerations such as income that drive self interested behaviour. Doctors want not only to improve their economic status but also maintain a certain lifestyle, have respectful working relationships with their colleagues and the ability to make clinical decisions without too much interference. That said, a doctor's failure to be entirely empathetic to the patient is not only driven by individualistic elements but also by organisational constraints, such as time pressure and long lists.

On the patient's side, the literature of Health Economics is more limited in modelling patient behaviour. Significant progress has been made by the lately increasing field of Behavioural Economics, which has resulted in models that offer useful insights into the reasons for patients' decisions by introducing the notion of beliefs in their utility functions. The core of these models is based on the Psychological Expected Utility theory (henceforth PEU theory) introduced by Caplin and Leahy (2001). The theory is an extension of the expected utility theory of von Neumann-Morgenstern to situations in which agents experience feelings of anticipation regarding future states. It allows for the patient's utility function to

depend not only on physical outcomes but also on *beliefs* about future physical outcomes.[2]

The PEU is mainly driven by the anxiety theory, but it seems compatible with a number of psychological models that examine the extent to which *health beliefs* can predict behaviours. They include the Health Belief Model, the Theory of Reasoned Action and the Theory of Planned Behaviour, which, as mentioned above, have been used extensively to examine non-adherence to medical recommendations (Hounsa, Godin et al. 1993; Budd, Hughes et al. 1996).

The PEU theory has been used to explain how anxiety may lead patients to avoid visiting the doctor (Köszegi 2003). Köszegi (2004) has also proposed a model describing the doctor-patient relationship where the doctor makes choices of actions taking into consideration the patient's emotions. The model identifies a number of complications in the doctor-patient interaction that are attributed to anxiety, such as the paradox of emotional patients getting less useful information. However, it does not allow patients actively to reject doctors' recommendations.

Caplin and Leahy (2004) have also applied the PEU theory in a model describing doctor-patient interaction but in a way different to the one presented by Köszegi. They explore the optimal procedure for supplying information to a patient who experiences anticipatory emotions regarding a future health status, after he has sent a signal regarding his emotional status. However, all the above attempts to model the doctor-patient relationship are based on the assumption of a perfect agency model, i.e. that the doctor is entirely empathetic to the patient and he maximises the patient's utility function as if it were his own.

2.3.2.5 Towards a holistic theoretical framework

The models of doctor-patient interaction described above focus on a specific aspect of this relationship, the decision making process. This is without doubt very important especially with regard to understanding non-adherence and it also helps to narrow down the complexity of the issue. However, it does not offer a holistic

[2] More detailed explanation of the Psychological Expected Utility theory and its application to the doctor-patient relationship is given in Chapter 6.

perspective of the relationship and therefore it is not sufficient to understand the problem as a whole.

In a review of the literature of the doctor-patient relationship, Ong et al. (1995) proposed a theoretical framework that relates background, process and outcome variables and allows for clear hypotheses regarding these relations. The suggested theoretical framework is presented in Figure 2.5. It is composed of three main elements: the actual content of communication, the background variables and the outcomes resulting from this.

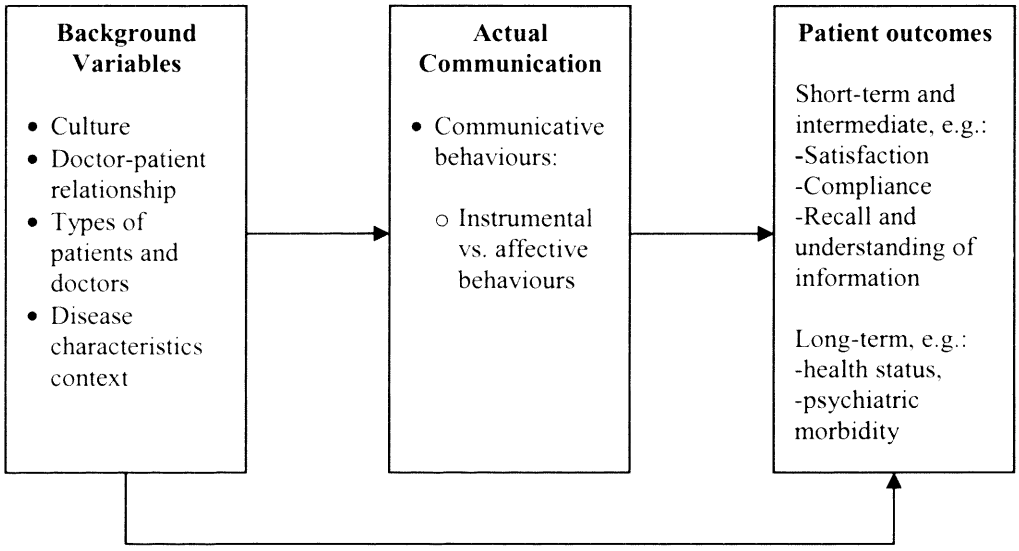


Figure 2.5: Doctor-patient relationship ***(taken from Ong et al. (1995)).***

The first direct effect is between background variables and the actual content of communication. Background variables include cultural factors that have been reported to affect the consultation (Ong, de Haes et al. 1995). They also include doctor-patient relationships in general, that is, if the relationship is regarded as a paternalistic one where the doctor has high control then it is to be expected that instrumental behaviours will be leading the consultation. Also, the different types of patients and doctors are important variables that affect the actual consultation, although there is a lack of empirical evidence to test this. Finally, disease characteristics are reported as background variables, as it has been argued that physicians may be communicating differently with their healthier patients than with less healthy ones (Ong, de Haes et al. 1995).

The second direct effect is between the actual communication and patient outcomes. This relationship is clearer and has been supported more widely by empirical evidence. The term 'outcome' as used in health care can be defined as "an observable consequence of prior activity occurring after an encounter, or some portion of the encounter is completed" (Beckman, Kaplan et al. 1989). There are many outcomes related with the doctor-patient relationship including actual health status and quality of life but also satisfaction and – what is of interest for this thesis - adherence to recommendations.

However, it is less straightforward and more complex to explain the relation between background variables and patient outcomes. The complexity of this relationship lies in two aspects: the methodological difficulty of testing the association between the background variables and the patient outcomes; and the difficulty of isolating the indirect effect of these variables, given that they influence the actual communication behaviour, which in its turn affects outcomes. Therefore, this aspect of the doctor-patient interaction in effect remains unexplored.

As far as adherence is concerned the model argues that doctor-patient interaction affects patients' decisions to follow recommendations in two ways. First, the communication behaviour during the actual consultation has a direct effect on non-adherence. Secondly, background variables, such as the doctor-patient relationship in general may affect it directly and indirectly through the actual communication process, which in its turn influences non-adherence.

Regardless of the flaws in the framework by Ong et al. (1995), it does provide a systematic and holistic perspective to the doctor-patient relationship and facilitates the understanding of how this relationship impacts on the patient's decision to adhere to recommendations. The model illustrates clearly the associations between background variables, actual consultation and non-adherence. This thesis examines associations between these three aspects and therefore the model provides a useful framework that brings the three parts of the thesis together. This is more clearly and explicitly explained in Chapter 3.

2.3.2.6 Discussion

The theoretical models discussed above are in agreement in one regard: the complex and multifaceted nature of the doctor-patient relationship. The models acknowledge that there is no single, commonly accepted theory that captures all aspects of this relationship and all are attempting to understand some of its components.

This thesis focuses on the impact that the doctor-patient relationship has on a patient's decision to non-adhere but investigates the issue from different angles looking at the population level, the attitudes and beliefs of a specific patient group and the actual consultation. It therefore requires a conceptual framework that examines the relationship in a holistic way. For that purpose, the Ong et al. (1995) model is considered the most adequate one as it provides a holistic view of the issue. It clearly states how the actual consultation fits within the more general context of the country, and also how it is associated with the patient's decision to non-adhere. The model and the ways in which it serves the aims and the specific research questions of this thesis are discussed further in Chapter 3.

In addition to the general conceptual framework, the models that look at the doctor-patient relationship in the more specific context of the decision-making process, i.e. the paternalistic, shared-decision and informed decision model as well as the principal-agent model, also provide useful insights for this thesis. For the empirical studies the models are used to interpret the results and identify any patterns in the way the doctor-patient relationship is perceived in Greece. To put it in another way, the two empirical studies may shed light on whether any of these models adequately explain the nature of the doctor-patient relationship in Greece, i.e. whether it is a paternalistic or a shared-decision making relationship, as well as looking at how this affects non-adherence to recommendations.

Chapter 6 of the thesis looks at how conflicts that occur during the consultation affect patients' decision to non-adhere. The chapter in effect challenges the models of the doctor-patient relationship, especially the perfect-agency model, arguing that they fail to explain the conflicts between the doctor and the patient. It proposes a game theoretical approach to understanding the differences between the two parties, which may often result in the patient non-adhering to the recommendations.

Arguments come from empirical evidence that claim the doctor and the patient come to the consultation with different purposes and agendas, which, if not met, lead to sub-optimal results such as non-adherence to medication. The review of the empirical studies that follows, in particular Section 2.4.2 on the impact of the doctor-patient relationship, supports these arguments.

2.4 Review of the empirical studies

The literature of empirical studies on determinants of non-adherence as well as on the impact of doctor-patient communication is quite diverse, varying from epidemiological to psychological approaches. The present chapter draws on a range of previous systematic reviews and reports to provide a general picture.

The reviews include the updated one of the Royal Pharmaceutical Society of Great Britain (RPSGB) on compliance across a number of medical conditions (Carter, Taylor et al. 2003) and the systematic review of communication between patients and health care professionals, also commissioned by the RPSGB (Cox, Stevenson et al. 2004). The WHO (2003) report on non-adherence, and that for the National Co-ordinating Centre for NHS Service and Delivery and Organisation R&D (NCCSDO) (Horne, Weinman et al. 2005) were also very useful sources of information.

The empirical studies that have been carried out to identify the determinants of non-adherence are numerous and vary significantly depending on the setting, the aim and the methods used. They are quantitative or qualitative in the methodology they employ, although some of them combine both aspects. The majority do not use a specific theoretical model from the ones presented in the previous chapter but do, however, have specific research hypotheses to test.

The rest of this section is as follows. First, an overview of the available methods used to measure non-adherence to medication is presented. It then reviews the studies on determinants of non-adherence categorising them into four groups of factors: demographic and socioeconomic, disease-related and regimen-related factors, and also patient beliefs. This categorisation is by no means completely inclusive, but it is an attempt to organise the chaotic empirical literature of non-

adherence. Finally, given the focus of this thesis, the studies looking at the impact of the doctor-patient relationship on non-adherence are then presented in more depth.

2.4.1 Measurement of non-adherence

The main methods of measurement of non-adherence can be grouped into two major categories: direct and indirect. Each measurement procedure offers somewhat different information and has unique advantages and disadvantages (Dunbar 1984).

In terms of accuracy, ***indirect methods*** of measuring adherence are less important than direct ones, but they are far more practical. They can be distinguished in the following categories:

a) Self-report strategies. This method asks the patient directly about his/her adherence with the use of questionnaires or diaries. Although it seems to be the most commonly used method, some authors such as Gordis (1979) claim that there are serious questions regarding the validity of the interview responses, since patients often report higher adherence rates. Even when providers are asked to rate the degree to which patients take their prescribed medication they also often overestimate adherence (DiMatteo and DiNicola 1982).

b) Behavioural counts include strategies such as pill counts. This method measures adherence through the comparison between the amount of medication remaining in the patient's bottle and the amount that should remain.

c) Electronic monitors is a somewhat novel approach to indirectly monitoring a person's medication-taking behaviour in an objective manner. The medication packaging contains a microprocessor that records the time and date the container was opened or the medication released. This is considered to be the most accurate of the indirect methods for measuring non-adherence to medication as it gives detailed information not only on the number of pills but also the time when the pills were taken. It is, however, a costly method that is only available under specific settings and it is not appropriate when a combination of medication is taken.

For accuracy, ***direct ways*** of measuring patient adherence are essential, but they are not without their limitations either. They can be classified into the following groups:

a) Biological indicators. This method measures adherence by looking for the presence of the drug in the blood or urine. This method is costly and findings can be

misleading as they may be influenced by a variety of individual factors including diet, absorption and rate of excretion (Vitolins, Rand et al. 2000).

b) Clinical outcomes. A direct way of measuring adherence is to consider the treatment outcome. This means, that if the desired outcome occurs, then the researcher can assume that the patient was adherent, and if not then he/she was non-adherent. This method is rarely encountered in the review of empirical studies, possibly due to its great subjectivity.

In general, it is the nature of the research questions, and the availability of resources, that determine which of the above methods is the most appropriate.

2.4.2 Determinants of non-adherence

Some reviews group the studies of the determinants of non-adherence according to the disease they are examining, while others according to the methods that were used, i.e. quantitative and qualitative. The structure followed here is an attempt to organise the studies on the basis of the main factors they investigate. This is an attempt to get an overview of the determinants of non-adherence. The doctor-patient relationship, as a factor affecting non-adherence, is reviewed separately at the end of this section.

2.4.2.1 Demographic and socioeconomic factors

There is no general consensus on the effect that demographic and socio-economic factors have on non-adherence to medication and the studies analyzing these factors present contradictory results. While, as seen below, a number of studies found significant association between these factors and non-adherence, this is not always the case. Demographic factors did not predict non-adherence in the study by Brus (1999) on patients with rheumatoid arthritis in the Netherlands and the study by Lin et al. (1995) on patients with depression in the USA.

- *Age*

The effect of age on non-adherence is often conflicting. Faulkner et al. (1998) analysed the database of a large prescription management company in the USA and

showed that non-compliance was associated with younger age. Similarly, in a study by Larsen et al. (2002) analyzing compliance with statin treatment with data taken from a prescription database in Denmark, younger patients seemed to adhere less than older ones. In rheumatoid arthritis older age was also associated with higher adherence in a study by Part et al. (1999) in the USA and a three year longitudinal study conducted in Norway, France and the Netherlands by Viller et al. (1999).

In a study by Bloom (1998) among patients under antihypertensive medication in the USA the results were less clear. It was shown that patients aged more than 65 as well as those less than 40 showed higher persistence rates with medication. Similarly inconsistent results were shown in the study of patients on anti-epileptic drugs in the UK, where being a teenager or being aged under 60 was a predictor of non-compliance (Buck, Jacoby et al. 1997).

Other researchers in the USA, however, argue that adherence is particularly problematic for those over 75, due to a number of critical factors, such as cognitive changes related to ageing, the existence of one or multiple chronic illnesses and the fact that people may also be prescribed multiple prescription medication (Dunbar-Jacob and Mortimer-Stephens 2001).

- ***Social environment and life style***

A quantitative survey among HIV patients in the USA reported that more adherent patients lived further from their treatment site, did not live alone and were more likely to depend on a significant other for support, socioeconomic or emotional (Morse, Simon et al. 1991). There is also increasing evidence that life style affects non-adherence. A busy lifestyle predicted non-adherence in a study by Park et al. (1999) in a sample of patients with rheumatoid arthritis in the USA.

- ***Income and socioeconomic status***

In a study by Paterson et al. (2000) in the USA HIV adherent patients were more likely to be older, to be white and to have higher monthly income. They had been infected for longer and had fewer alcohol abuse problems compared to the non-adherent people.

- ***Education***

Evidence on the impact of education is also conflicting. In a review of the factors associated with better adherence in psychosis by Nose et al. (2003) four studies identified a positive relationship between higher education and adherence to treatment programmes.

However, a few studies have shown opposite results. A study by Ruscher et al. (1997) on psychiatric patients' attitudes in Canada found that patients with only elementary education were more likely to adhere to their medication. The authors argue that more educated people may be more "interested in or feel more confident about exercising control over their medication regimen" and this may explain why they adhere less to the medication.

To sum up, the results on the effect of socio-demographic factors presented above, i.e. age, income, education and life style, are contradictory. Older age is associated with better adherence in some studies, but reported to be a predictor of non-adherence in others, possibly due to forgetfulness or a more complex regimen. Findings on the impact of education were also inconsistent. Some studies showed no significant correlation between socio-demographic factors and non-adherence. These inconsistencies may explain a tendency to depart from studies that are looking for the 'typical' - in terms of demographic and socioeconomic characteristics - non-adherent person and to consider demographic factors as influences rather than direct determinants (WHO 2003).

2.4.2.2 Disease-related factors

Findings on the effect that disease related factors, such as severity and symptoms, have on non-adherence vary among different studies. In Hormone Replacement Therapy (HRT) two studies report different types of association between symptoms and non-adherence. Hunter et al. (1997) found women on HRT in the UK would avoid medication for menopause, which they perceived as a natural process, unless severe symptoms were reported. However, in Bjorn and Backstrom's study (1999) women with HRT in Sweden reported they stopped taking medication because they expressed a desire to find out if climacteric symptoms had ended and wished to deal with problems naturally. Gao and Nau (2000) investigated the relationship of disease

severity and adherence among HIV/AIDS patients in the USA and concluded that patients in later stages of the disease were more adherent than those in early stages.

On the other hand, a number of studies present the opposite results. Mann et al. (1992) in the USA tested the hypothesis that adherence to inhaled corticosteroids improves during periods of increased severity of asthma and found no significant relationship between the change in asthma severity and compliance with the regimen. Similarly, Lin et al. (1995) in a study among patients in antidepressant therapy in the USA have shown that the severity of the disease did not predict non-adherence. Two studies on rheumatoid arthritis also confirm no relationship between illness severity and adherence to medication (Brus, van de Laar et al. 1999; Park, Hertzog et al. 1999).

To sum up, studies on disease related factors show that severity of the condition as well as symptoms may be related with higher rates of adherence. However, results are not always consistent.

2.4.2.3 Regimen-related factors

Problems with the use of medication, such as side effects and difficulties in the consumption of the drug were reported by Barber et al. (2004) as the main factor for non-adherence to new medication in a study in the UK. In the same study, where patients were interviewed ten days and four weeks after recruitment, it was shown that information needs was an additional reason for non-adherence to medication. Side-effects were also reported as a main determinant of non-adherence in a study by Bernman et al. (1997) analysing prescription refill data from 2106 women with Estrogen Replacement Therapy in the USA. Negative side-effects were also associated with non-compliance in a study by Bjorn and Backstrom (1999) among women with HRT in Sweden. On the other hand, side-effects only at severe levels were associated with non-adherence in anti-depressive therapy (Myers and Branthwaite 1992).

Bloom (1998) analyzed a prescription database in the USA and concluded that regimen characteristics influenced patients' use of drugs. The study showed that

initial drug choice seemed to influence discontinuation of therapy, i.e. those patients taking A-II antagonist therapy were more likely to continue their therapy.

Simple one-drug regimens were associated with better compliance and persistence than more complex multiple-drug regimens in a study by Dailey et al. (2001) among patients with anti-hyperglycemic drug regimens participating in the Medicaid program in the USA. Likewise, the analysis of the MEMO database in Scotland showed that administration of one tablet per day was associated with greater adherence than multiple tablets (Donnan, MacDonald et al. 2002). Good compliance was inversely associated with the use of multiple pharmacies and number of medications prescribed overall, as shown by Monane et al. (1997), who analysed 8,643 outpatients with newly prescribed anti-hypertensive therapy in the New Jersey Medicaid programs. According to this study good compliance was associated with the use of newer agents.

On the other hand, in a study of 128 patients with type 2 diabetes in a health centre, north of Boston, it was found that the number of medicines prescribed was not correlated with non-adherence while side-effects were the most commonly reported problem with medication use (Grant, Devita et al. 2003). Medication load did not predict adherence errors in the study by Park et al. (1999) among patients with rheumatoid arthritis in the USA. In a study on antidepressant medication by Myers and Branthwaite (1992), there was no significant difference in compliance between doctor-prescribed and patient chosen regimen or between dosage once a day and three times a day.

Difficulty using inhalers, inconvenience and laziness were reported as determinants of non-compliance among 49 patients with asthma in Greater Glasgow (Buston and Wood 2000). Inability to access medication, forgetfulness, interruption of routine and lack of reminders, were associated with unintentional non-adherence by Johnson et al. (1999) among elderly people with hypertension in the USA. Similarly, Meystre-Agustoni (2000) interviewed 37 patients on antiretroviral therapy in Switzerland and reported that conflict between recommendations and daily life as well as side-effects were the main factors associated with non-adherence.

To sum up, the evidence shows that regimen-related factors, including side-effects and complicated dosages, are not consistently associated with higher rates of non-

adherence. A possible explanation could be that it is not the complexity of the regimen that results in non-adherence but rather the conflict of taking the regimen with the patient's daily routine.

2.4.2.4 Patients' beliefs

There is increasing evidence on and considerable research attention to patients' beliefs and whether they affect their decision to adhere or not. The term 'beliefs', however, is quite diverse, varying from beliefs regarding specific medication and illness to the social representation of medicines.

Adams et al. (1997) conducted in-depth interviews with asthmatic patients and concluded that their attitudes to medication practice were linked to their beliefs about their coping strategies. These beliefs in turn were linked with the extent of their acceptance and rejection of the identity of 'asthmatic'. Similarly, Buston and Wood (2000) in a qualitative survey in Scotland support the idea that denial that one is asthmatic and the belief that the medication is ineffective were reasons for non-compliance. They also report fears of side effects. Similar fears among asthmatic patients of side effects and dependence, weight gain, building large muscles, causing infections and making bones brittle were associated with non-adherence in a study by Boulet (1998) in Canada.

In epilepsy, fear of dependence not only on medication but also on family, friends and doctors and the fear of stigmatisation were reasons for patients not taking their medication (Buck, Jacoby et al. 1997). The perception of the medication as not needed or not effective or even not safe has been reported as a main determinant of non-adherence in studies on hypertension in the UK (Benson and Britten 2003).

Horne et al. (2001) focus largely on the analysis of patients' beliefs and their impact on adherence to medication, mainly using elements from the self-regulatory. Studying haemodialysis patients in the UK they found that intentional non-adherence with medication correlated with concerns about potential adverse effects. In another study among asthmatic patients Horne and Weinman (1999) report that non-adherence was associated with doubts about the necessity of medication and

concerns about its potential adverse effects with more negative perceived consequences of illness.

Views towards menopause and medication were associated with the use of Hormone Replacement Therapy use in a qualitative study by Hunter et al. (1997) in the UK. In another study on HRT, fear of cancer was one of the main reasons for non-adherence among women who were enrolled in a health maintenance organization in the USA (Siegel, Karus et al. 2000).

In many cases patients avoid medication because they are afraid that treatment will reveal their disease. This is supported by the study by Meystre-Agustoni (2000) among HIV patients in Switzerland.

Morgan and Watkins (1998) examine how cultural beliefs affect beliefs about medication and therefore adherence among patients recently being treated for hypertension in a borough of London. They showed that West Indians' beliefs were often associated with the use of herbal remedies and traditional cultural patterns. Siegel et al. (2000) have investigated potential racial differences in a number of attitudes domains that have been linked to adherence among patients with HIV/AIDS. They found significant differences between African and White American men in the USA. Africans expressed more doubts regarding their ability to use and adhere to protease inhibitors and more doubt regarding physicians' competence.

In general, there is increasing evidence that patients' beliefs about illnesses and medicines, such as fear of side-effects and dependency, concerns about their necessity and stigmatisation are a significant predictor of adherence. What is also worth mentioning is that these beliefs may derive from considerations unrelated to the drug's pharmacology (Barry, Bradley et al. 2000).

2.4.2.5 Doctor-patient communication related factors

Moving from the concept of compliance to the concept of adherence, where the patients play a more active role during the consultation, more emphasis is placed on the doctor-patient relationship and its influence on the use of medication.

In terms of methodology used, the majority of the empirical studies on the doctor-patient communication do not investigate the relationship directly, i.e. through videotape and observation. As will be shown below, they mainly examine patients' or doctors' perception of this relationship. The studies presented are divided into those that look at the patient's perception of the issue, those that look at the doctor's perception and finally those that examine the issue on a two-way basis.

- ***Patient's perception***

The evidence suggests various factors affect a patient's perception of the doctor-patient relationship and consequently adherence. Farber et al. (2003) conducted telephone interviews with parents of asthmatic children in the Medicaid program in the USA and reported that misunderstanding of medication was associated with decreased adherence. The risk of misunderstanding was lower if the patient had seen a specialist. Berman et al. (1997) showed that the physician's gender as well as his/her specialty was associated with non-adherence. Confidence in the physician and the health care system as a whole led to better adherence in the study by Kjellgren et al. (1998) in Sweden. Physicians' follow-up communication style and client satisfaction were both predictors of better adherence in the US (Bultman and Svarstad 2000).

- ***Doctor's perception***

Stevenson et al. (2000) interviewed 20 doctors in the UK to examine the decision making process in the patient-doctor communication about drugs. They found no evidence that patients and doctors followed a decision making model. Therefore patients used medication in a different way to that the doctors had suggested, or volunteered to try alternative therapies such as acupuncture and herbal remedies.

- ***Two-way communication***

In a qualitative study by Barry et al. (2000) in England doctors and patients were interviewed to examine their level of communication during consultation. Indeed, it was shown that most of the patients' desires were not met during the consultation and this led to poor adherence. Further analysis of the same qualitative study by Berman et al. (1997) showed that misunderstandings between patients and doctors have potential or actual adverse consequences, leading to non-adherence.

Jenkins et al. (2003) interviewed both patients and GPs to correlate their expectations and potential non-adherence. They found that patients had high expectations for communication and participation in the consultation and that unnecessary prescribing and problems in communication may lead to poor outcomes in terms of non-adherence. Lin et al. (1995) support the belief that discussion with physicians can give better results in terms of adherence in antidepressant therapy in a study in the USA.

2.4.3 Discussion

The empirical studies that investigate patients' perceptions of the doctor-patient relationship are not without their limitations. The majority focus on specific settings and consultations and refer to specific doctors. However, the general perception that patients or the population have about doctors and its impact on the patient's decision to adhere has not been fully investigated. The country context and the health system within which the issue is examined needs to be investigated further. Also, empirical studies on the effect of the doctor-patient relationship on non-adherence do not have a clear theoretical background. A more systematic effort to view the issue in a more holistic way is necessary.

This thesis builds on the empirical evidence in two ways. First, findings from existing studies provide useful insights into what determines non-adherence among patients and therefore similar aspects can be tested in the general population. This is investigated in the analysis of the population survey presented in Chapter 4. Previous studies that have tested the validity and reliability of different scales were particularly useful in identifying which scale was to be used in the questionnaire survey in Greece (Chapter 5).

Secondly, empirical evidence has shed light on a number of conflicting aspects of the doctor-patient relationship that are not captured in any of the existing theories. Hence, they provide strong arguments that help the development of the theoretical framework presented in Chapter 6.

2.5 Greece and the Greek health system

This thesis investigates the problem of non-adherence in Greece, a country where no previous systematically collected evidence on the issue exists. Some background information on the country's health profile and the structure of the system provides the context for the analysis and also facilitates the understanding of the methods used in this thesis. It also helps explain the results of the empirical parts.

2.5.1 Health profile

Life expectancy in Greece, following the trend of most European countries, is increasing. According to the WHO (2007), in 2005 life expectancy at birth for Greek women was 82 years while that for men was 77 years. The healthy life expectancy at birth was respectively 73 and 69.[3]

Cerebrovascular and ischemic heart diseases are the top two causes of death in Greece, accounting for almost one third of the total deaths in 2002 (20% and 15% respectively) and 28% of years of lost life, WHO (2007). Trachea, bronchus and lung cancers follow, accounting for 6% of the total deaths, reflecting one of the biggest health issues in Greece in the last decades - smoking. Greece has the highest prevalence of smoking, not only among members of the European Union but also among all members of the OECD, with studies estimating that 40% of the adult population are daily smokers. One in two adolescents in certain areas is also a current smoker (Vardavas and Kafatos 2007).

Obesity is the other big problem in public health in Greece. Recent studies show that obesity levels have increased dramatically over recent years, bringing Greeks among the most obese citizens of the European Union (Obesity 2002). Results are even worse when it comes to childhood obesity. Over 30% of Greek children were estimated to be obese or overweight in 2000, and studies in regions of Greece reveal that bad dietary habits and lack of exercise are the main reasons for these numbers (Kosti, Panagiotakos et al. 2007). Despite the increasing evidence that specific conditions are deteriorating and threatening public health, there are currently no disease management programmes in Greece to tackle any of these problems.

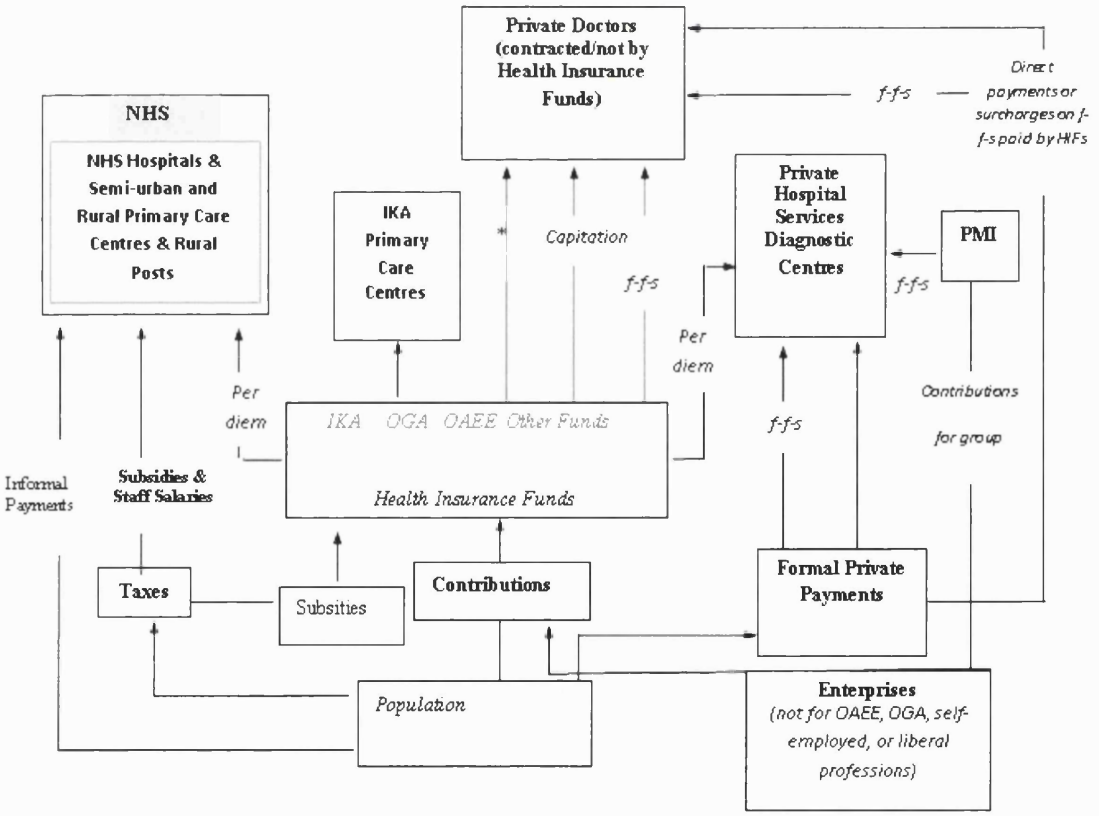
[3] Statistics on healthy life expectancy at birth are based on 2002 data.

2.5.2 Structure of the health system

Finance and delivery

A National Health System (NHS) was introduced in Greece in 1983. The Greek health system is highly centralised. Three ministries are involved in the finance and delivery of health care. The Ministry of Health and Welfare is responsible for the NHS. The Ministry of Labour and Social Insurance is responsible for the insurance funds, which play a significant role in financing and providing health services. The Ministry of Finance is retrospectively subsidising the NHS and Health Insurance Funds (HIFs) (Mossialos, Allin et al. 2005).

The Greek health system has a mix of public and private funding. Taxation and social insurance are the two sources of public financing, but entitlements are defined through occupationally-based insurance fund membership and not on the basis of citizenship. Figure 2.6 briefly illustrates health care funding and delivery in Greece.



* OGA contracts private doctors for repeat prescriptions. F-f-s refers to payment by fee-for-service).

Figure 2.6: Organization of the Greek health system: financing flows and delivery of health services (*taken from Mossialos et al. (2005)*).

Health services coverage and access

Two main types of coverage are available to the population: health insurance funds and private medical insurance. The NHS offers a third type of coverage, as anyone can access public hospitals and rural and semi-urban primary health centres, even if they have no insurance or are illegal immigrants. Most funding is public from taxation and social insurance (56.3% of total expenditure), with payments from private health insurance accounting for about 2.3% and the remaining 41.4% from out-of-pocket payments, a significant proportion of which are informal (Mossialos, Allin et al. 2005).

Insurance coverage is compulsory for all employed persons and their dependants. There are approximately thirty social health insurance funds providing coverage to the vast majority of the Greek population. Three of them cover about 80% of the population: the Social Insurance Organisation (IKA) covers the majority of the working population; the Agricultural Insurance Organisation (OGA) covers agricultural workers; and the Insurance Organisation for the Self-employed (OAEE) covers professionals, small business and merchants. Other funds include those for the self-employed, civil servants and military personnel, banking and public utilities. The unemployed are covered through government benefits. The retired population continues to be covered by their pre-retirement insurers, apart from OAEE, which shifts its retired population to IKA (Mossialos, Allin et al. 2005).

Private financing plays a significant role in the health system, particularly in the form of direct and informal payments, and to a lesser extent, through private medical insurance (PMI), levels of which remain quite low. Approximately 8% of the Greek population has PMI, which covers services in the private sector. Mossialos et al. (2005) argue that this may be explained by the reluctance of individuals to pay a third party, in addition to cultural and historical factors. When people are accustomed to paying their doctor or a hospital directly, the transfer of money to a third party may be seen as an unnecessary erosion of the patient-doctor relationship and a reduction in the assurance of quality of care (Mossialos and Thomson 2002). On the other hand, out-of-pocket payments in Greece, mostly direct and informal payments, are the highest in the European Union. The way primary health care provision is structured and financed forces patients to use both public and private

services concurrently. Doctors are able to transfer patients from social insurance funds, where they work part-time, to their private practices.

Although private practice for public hospital doctors has been forbidden since 1983, except for university hospital doctors and doctors working for the army, many doctors run illegal private practices or ask for informal payments. Since 2002 there has been an attempt to legalise limited private practice for hospital based doctors in order to formalise some informal payments, but the idea has not been popular among doctors. Possible explanations could be the public ethos, the lack of incentives as informal payments are still higher, tax reasons and the oversupply of specialists in Greece, which reduces the opportunities to attract private patients.

Health care delivery

There is currently a plethora of physicians in Greece. In 2004 there were 4.9 practicing physicians per 1000 Greeks. On the other hand, the number of nurses is very low, with only 3.8 nurses for the same size of population.[4] This indicates that there is a lack of nurses who could take over some of the doctors' responsibilities, which results in expensive heath care delivery. There were also 1.2 dentists per 1000 population and 0.8 pharmacists for the same number of people and an excess of specialist doctors (OECD 2006).

Due to the lack of organised primary health care coupled with limited encouragement to produce more general practitioners, there is currently no system of referral. There is no integration between primary and secondary care in the Greek health system.

Expenditure trends

Greece spends a significant proportion of its wealth on health care and is heavily dependent on private expenditure. In 2004, Greece spent in total 10% of its Gross Domestic Product (GDP) on health; public expenditure was 5.4% of GDP while the other 4.6% was private (OECD 2006).

[4] Data on nurses refers to 2002.

Payment of doctors

In public hospitals and health centres doctors are salaried, while contracted doctors in ambulatory settings are paid on a fee-for-service basis. All public hospital doctors are full-time employees and until recently they were not allowed to see patients privately for fees. However, this did not work in practice and public hospitals are often used by doctors to recruit patients for private practices. Informal payments is an ongoing issue that the medical associations argue it exists because of the low payments.

Doctors in primary care are paid on a fee-for-service basis with the exception of two insurance funds: doctors in OAEE are paid on a capitation system, while in IKA they are salaried. Anecdotal evidence suggests that when doctors are paid on a fee-for-service basis fees are set relatively low and doctors inflate their claims in order to increase their income by adding false consultations (Davaki and Mossialos 2006).

Therefore, as Davaki and Mossialos (2006) point out, the medical care payment system in Greece does not provide doctors with incentives to improve efficiency and quality.

CHAPTER 3

RESEARCH QUESTIONS AND GENERAL METHODOLOGY

3.1 Introduction

This chapter presents the research questions and hypotheses of the thesis. It builds on the literature review of the empirical studies and theoretical models presented in the previous chapter. A section presenting the general methodology that is used to address the hypotheses and questions of the thesis follows.

3.2 Research questions and hypotheses

The aim of this thesis is twofold. It empirically investigates the relationship between the doctor-patient interaction and non-adherence to medication in Greece, a country where no previous available evidence exists. Investigation is undertaken both on a population and a patient level. It also develops a theoretical model of the doctor-patient relationship using non-cooperative game theory to explain how supply of information under conflict conditions affects non-adherence.

After a careful review of the literature, the model of doctor-patient relationship proposed by Ong et al. (1995), described in Figure 2.5 above, is chosen as the one that provides a holistic view of the issue and identifies clear hypotheses on the associations between background variables, actual communication and patient outcomes.

Three aspects of the doctor-patient relationship are examined in this thesis:

- The direct effect that the background variables have on patients' outcomes (Figure 3.1). More specifically, the thesis examines how the context of the country within which the issue of the doctor-patient relationship and non-adherence is investigated helps in understanding an individual's decision to non-adhere. In particular, the way people think of their doctors and perceive the doctor-patient relationship is important in understanding how they behave when they are prescribed medication. The lack of available empirical evidence in the area indicates the importance of further research in this aspect of the doctor patient

relationship. This is examined in Chapter 4, where the European Social Survey is analysed.

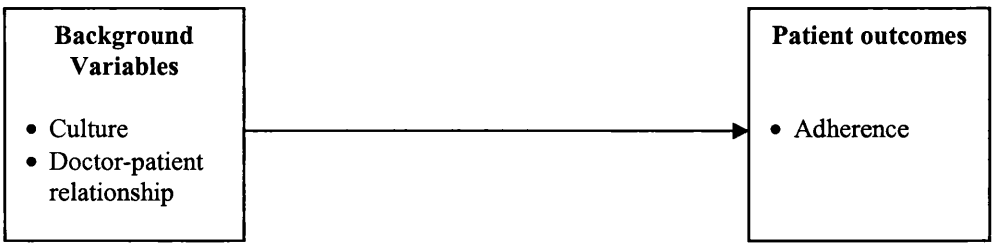


Figure 3.1: The direct effect between background variables and adherence.

- The direct effect that the actual communication has on patient outcomes (Figure 3.2). The thesis investigates how specific aspects of the actual communication have an impact on patients' decision to adhere. In particular, issues that are examined are the perception of the doctor's role during the consultation, the supply of information and the beliefs that patients have about aspects of their illness and their medication. This part builds upon elements of the psychological theories presented in Chapter 2 and also evidence from empirical studies in similar settings. This is examined in Chapter 5 of the thesis, through the questionnaire survey conducted among Greek hypertensive patients.

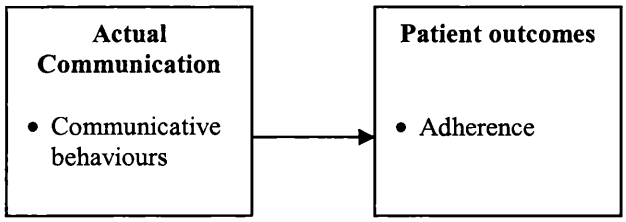


Figure 3.2: The direct effect the actual communication has on adherence.

- The effect that background variables have on the actual consultation and consequently on outcomes (Figure 3.3). More specifically, the thesis looks at how different patient preferences affect the consultation and this in turn affects their final decision. Empirical evidence has shown that the two parts come to the consultation with different agendas, which, when not met, may lead to non-adherence. However, there is a lack of theoretical framework to capture these conflicts and this thesis fills this gap by introducing a game theoretic approach to addressing the issue and explaining non-adherence. This is presented in Chapter 6.

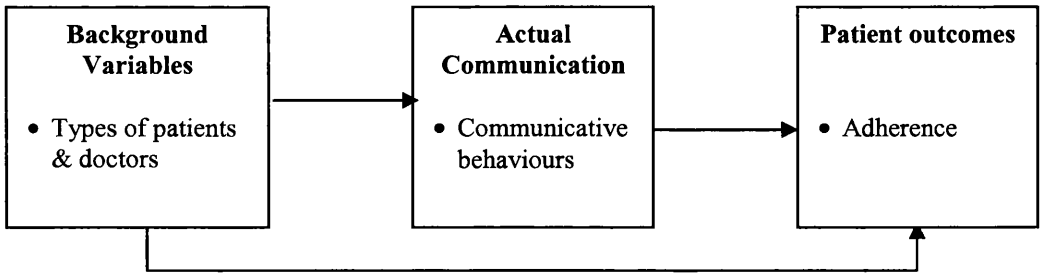


Figure 3.3: The direct and indirect effect of background variables on actual communication and adherence.

Having set the conceptual framework of the thesis, the specific hypotheses as well as the research questions that are used to test them are developed:

H1: The country context within which the issue of non-adherence is examined plays an important role in its understanding.

- **Q1:** What do Greeks believe about their doctors' role in prescribing and the treatment of illnesses? What are their general attitudes towards medicines?
- **Q2:** To what extent do these beliefs and attitudes differ from those of other Europeans?
- **Q3:** How do a population's beliefs about doctors, in Greece specifically and Europe in general, affect their decision to adhere to prescribed medication?

H2: The patient perceptions of doctor's role, above all else, have an impact on their decision to adhere to medication.

- **Q4:** What do Greek patients with hypertension think of their doctors and how does this affect their attitudes towards medicines?
- **Q5:** Which information channels do patients use and how do these channels influence patients' behaviour towards medicines? What is the importance of doctors in supplying information?
- **Q6:** What other factors may affect non-adherence? Is it beliefs towards the disease and the treatment or the disease and treatment characteristics themselves that influence non-adherence?

H3: A game theoretical approach that captures the patient's preferences for information and the doctor's inability to understand them may explain why patients fail to adhere to medical recommendations.

- **Q7:** Do previous theoretical models of the doctor-patient relationship explain differences between the two parties that may lead to non-adherence?
- **Q8:** How does a game theoretical model capture these differences?

3.3 General methodology

Two empirical studies and a theoretical framework are used to address the aims of the thesis. The specific methodology for each study and the game theory framework are discussed in greater detail in Chapters 4, 5 and 6. These different methodological approaches are due to the differing nature of the two empirical studies and the theoretical section. However, a broader introductory section is presented here to connect the main research hypotheses and questions of the thesis with the general methods to address them.

3.3.1 Empirical studies

Two empirical studies address hypotheses **H1** and **H2** and their related questions. Below is a brief description of the two surveys and how they are connected to the research hypotheses and questions.

3.3.1.1 European Social Survey

The first empirical study draws on data from the European Social Survey (ESS) to examine the views and beliefs of the Greek population about doctors and medication and their impact on non-adherence. It is used to address hypothesis **H1** and the related questions **Q1, Q2** and **Q3.**

The ESS is an academically driven multi-country survey covering over twenty nations. Its purpose is "to monitor and interpret changing public attitudes and values

within Europe and to investigate how they interact with Europe's changing institutions" (Jowell and the 2005). It satisfies high standard technical requirements. It involves strict random probability sampling, a minimum target response rate of 70% and rigorous translation protocols. These will be discussed in more detail in Chapter 4.

In the second round, the survey includes a section on health care. It includes questions on the health care system of the countries in general but also has specific questions on what the general population thinks of their doctors, and examines their beliefs and attitudes towards prescribed medication including non-adherence.

In the present study data from the second round of the ESS edition 2.0 is used, which includes 24 countries: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine and United Kingdom.

The thesis focuses on Greece and therefore the analysis uses data from this specific country. However, comparisons with the other European countries to identify idiosyncratic differences require the analysis of data on an aggregate level as well.

3.3.1.2 Questionnaire survey among hypertensive patients in Greece

The second empirical study is a questionnaire survey conducted in Greece to examine the views of a group of hypertensive patients on doctors and medications and their influence on the patient's decision. This study aims to answer hypothesis **H2** and the related research questions.

The survey was planned, designed, conducted and analysed for the purposes of the thesis. The questionnaire uses a number of items to examine patients' beliefs and attitudes towards medication and their views of the doctor's roles (**Q4**). Patients are also asked a number of questions regarding information channels (**Q5**), as well as other clinical and demographic characteristics to examine whether these may predict non-adherence to medication (**Q6**). Also, a number of questions indirectly try to identify whether it is beliefs towards the disease and the treatment or the disease and treatment characteristics themselves that influence non-adherence (**Q6**). Finally,

validated items are used to measure non-adherence to medication in an indirect and objective way.

The selection of the sample was based on specific characteristics of the Greek health system. Different methods of data collection were considered, including telephone survey, collection of questionnaires administered by a researcher, or mailing questionnaires to the patient to decide on the most appropriate one for the purpose of this survey. These methodological concerns are discussed further, and in more depth in Chapter 5.

3.3.2 Game theory model

A game theoretic approach is used to address hypothesis **H3** and the related questions. It presents three models of the doctor-patient interaction to describe the supply of information by the doctor during consultation. The models take the form of a non-cooperative game in an extensive form. They are all games between a doctor and a patient. The doctor diagnoses the patient and needs to decide how much information to provide. Patients vary in their preferences regarding information; they are distinguished between 'blunters', i.e. information-averse patients, and 'monitors', i.e. information-loving patients, following the work by Miller et al. (1987). After receiving the information, the patient needs to decide whether to adhere or not to the recommendations.

The first two models assume that the doctor knows with certainty the preferences the patient has regarding information. The first one assumes that the patient is a blunter while the second assumes that the patient is a monitor. The third presents a more realistic situation where the doctor does not know with certainty the type of patient. Model 3 is the most involved game of the three but also the one that explains how a doctor's failure to understand the patient's preference for more detailed information may lead to non-adherence to their recommendations.

In terms of preferences, all three models employ the Psychological Expected Utility (PEU) theory (Caplin and Leahy 2001). This theory, derived from the combined field of Economics and Psychology, is an extension of the expected utility theory of von Neumann-Morgenstern in situations in which agents experience anticipatory

feelings prior to the resolution of uncertainty. It has been used to explain supply of information during the consultation (Caplin and Leahy 2004) and to understand patient behaviour (Köszegi 2003). However, these previous models confine themselves to situations in which the doctor is entirely empathetic to the patient, and do not allow the patient actively to decide whether to accept the recommendations or not.

In an attempt to capture more realistic behaviours of the two agents, the thesis takes steps in new directions. The models presented in this thesis are novel in two respects. First, they relax the assumption of perfect agency, i.e. that the doctor maximizes the patient's utility as if it were his own. In order to do so, they introduce the assumption that the doctor needs to put effort into supplying information to the patient. Secondly, they allow for interdependent decisions with an active role both to the doctor, who needs to decide on how much effort to make and to the patient, who needs to decide whether to accept the doctor's recommendation.

Extensive game trees explain the order in which players move, their available actions, the information they have regarding their opponents and their strategies. In the case of Model 3, the uncertainty regarding the patient's preference for information is resolved under various hypotheses of bounded rationality. This is a well-known approach in economics for modelling problems with uncertainty so that progress in analysis can be made.

The models offer - under specific but reasonable assumptions - a complete resolution of the games, i.e. results are obtained concerning how much effort the doctor will put in and the patient's decision to adhere to the recommendations. They use comparative statics, give economic interpretations and finally allow for a discussion on the policy implications that they have. Limitations of the game theoretical approach used here as well as possible extensions are discussed after the presentation of the models.

CHAPTER 4

NON-ADHERENCE AND DOCTOR-PATIENT RELATIONSHIP; A POPULATION SURVEY

4.1 Introduction

The review of the evidence on the issue of non-adherence and the doctor-patient relationship in Chapter 2 has identified an important gap in the literature, which is the lack of empirical insights at the population level. This chapter empirically considers this important issue using data from the European Social Survey (henceforth ESS). It focuses primarily on Greece, but it allows for more general comparisons with the European sample to be made.

The doctor-patient relationship is mainly established during the consultation when the patient visits the doctor to seek diagnosis. However, this complex interaction goes beyond the clinical practice and involves elements that are developed outside the encounter. There are several pre-existing factors that have been shown to affect the actual communication during the consultation and its outcomes. Ong et al. (1995) refer to these factors as 'background variables' and categorise them into four main groups: (1) cultural variations, (2) the doctor-patient relationship, (3) the differences in the types of patients and doctors and (4) the specific disease characteristics. In this chapter we will focus on the first two groups: cultural variations and the doctor-patient relationship.

Cultural variations acknowledge that differences in historical, sociological and geographic context affect the way that medical care is perceived and therefore how individuals think of their health systems in general and their doctor more specifically. A study by Grol et al. (1999) compared seven countries to determine the priorities of patients in general practice care and to identify whether they vary in different countries in the way they perceive medical care. A common consensus was found with respect to the expectations people have regarding general principles, such as equity and access. However, the study also identified significant differences in a number of views, including speed of care and the doctor's role in providing care.

Grol et al. (1999) argue that these variations may partly reflect cultural differences, such as the extent to which individuals value an authoritarian or a democratic relationship with their doctor as well as their views on technology, prevention and their expectations for a quick solution to health problems. On the basis of their findings, they argue that variations may also reveal the actual differences in health care systems. For example patients "may value highly the care they are used to or the care which they would like to get and which is not provided". Indeed, Boerma et al. (1997) in a study looking at national differences in the structure and organisation of health care in Europe showed that these differences reflect the way individuals perceive doctors and the doctor-patient relationship.

It is also accepted that the way the doctor-patient relationship is perceived shapes the actual communication. If, for example, the relationship is regarded as paternalistic, where the doctor is the main decision maker and the patient obeys, it is very likely that this will affect the actual consultation (Ong, de Haes et al. 1995).

However, empirical evidence to support the association of cultural differences and general perceptions about the doctor-patient relationship with non-adherence to medication is limited. Non-adherence to medication is mainly examined at a patient level and the majority of the studies in the area, as shown in Section 2.4 of the review of the literature, focus on specific disease groups or consultation settings. It is therefore difficult to examine general perceptions and attitudes. In addition, large scale data that allows the analysis of the issue in the population is restricted. Hence, the association between the perception of the doctor-patient relationship and patients' decision to follow recommendations remains largely unexplored.

This part of the thesis aims to shed light on the perceptions of the doctor-patient relationship as these are formed within the country context. The aim is to examine how these perceptions affect the outcomes of the consultation and, more specifically, the patient's decision to adhere (See Figure 4.1). Other background variables, such as demographic and socioeconomic characteristics of the individuals, although they are not the primary focus of this study, will also be considered, mainly as control variables in the analysis.

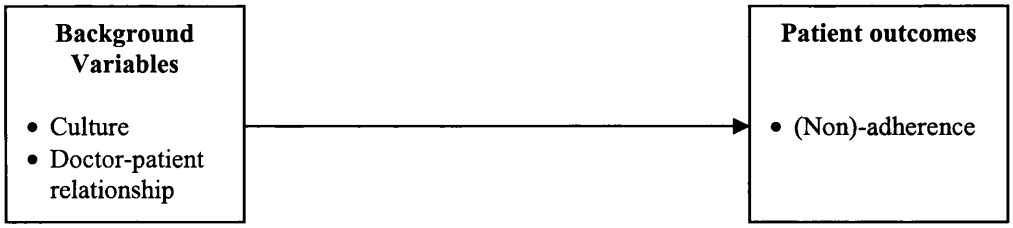


Figure 4.1: Association between background variables and outcomes.

For this purpose, data from the second round of the ESS is used (Jowell et al. 2005). This population survey examines individuals' beliefs and attitudes on a range of issues including health care. The doctor-patient relationship is at the heart of the survey's section on health care. Questions on people's attitudes towards medication, including non-adherence to prescribed medicines, are also included.

The main hypothesis that drives this part of the thesis is that the way people think about their doctors and perceive the doctor-patient relationship in general is important in understanding how they behave when they are prescribed medication. It is generally expected that the country where people live shapes the way they perceive this relationship.

More specifically, the research hypothesis tested in this chapter and the research questions that will be used to facilitate it are:

H1: The country context within which the issue of non-adherence is examined plays an important role in its understanding.

- **Q1:** What do Greeks believe about their doctors' role in prescribing and the treatment of illnesses? What are their general attitudes towards medicines?
- **Q2:** To what extent do these beliefs and attitudes differ from those of other Europeans?
- **Q3:** How do a population's beliefs about doctors, in Greece specifically and Europe in general, affect their decision to adhere to prescribed medication?

The rest of this chapter is organised in the following way. Section 4.2 begins with the methodology of the ESS. It then presents the specific variables of the survey which are appropriate to address the research hypothesis and questions. Section 4.3

presents the econometric model giving specifications on the test used. Section 4.4 shows the main results. It begins with comparisons on how the population in Greece differs from the other Europeans not only in the way they think of their doctors but also in their attitudes towards medication. Hence, it allows for idiosyncratic differences to be identified. It then focuses on the determinants of non-adherence to prescribed medication and compares the results of the Greek sample with those of Europe, which includes all 24 countries. Section 4.5 discusses the limitations of the study, while Section 4.6 discusses the findings in relation to the research questions and the policy implications. Section 4.5 concludes.

4.2 Data

This section describes the data used in this chapter. It begins by describing the ESS, giving details on the survey and sample design, the response rates and the questionnaire design. It then presents the main variables that will be used in the analysis, both dependent and explanatory. The latter are divided into those of primary interest, i.e. the main explanatory variables, and those that the analysis controls for, i.e. control variables. For all variables, detailed explanation is given on how they were used for the purpose of this thesis.

4.2.1 The European Social Survey (ESS)

The ESS provides a unique opportunity to explore the issue of non-adherence and the doctor-patient relationship among the population, filling a gap in the empirical evidence on the topic. Twenty-four European countries participated in the survey, and hence the analysis of the data makes it possible not only for the issue of non-adherence to be examined within a country context but also for comparisons between countries to be made. That makes the ESS a unique dataset to explore the aims of this part of the thesis. A population approach will give useful insights into the heterogeneity of different health systems and the impact on individuals' decisions to non-adhere. Also, analysing the issue of non-adherence and the doctor-patient relationship at the population level, rather than disease specific ones, will allow policy makers to identify more general interventions to tackle the issue.

The ESS is an academically-driven multi-country survey. Its three aims, as stated in its documentation, are "firstly, to monitor and interpret changing public attitudes and values within Europe and to investigate how they interact with its changing institutions; secondly, to advance and consolidate improved methods of cross-national survey measurement in Europe and beyond; and thirdly, to develop a series of European social indicators, including attitudinal indicators" (Jowell et al. 2005).

It is funded via the European Commission's 5th Framework Programme, the European Science Foundation, and national funding bodies in each country. The Norwegian Social Science Data Services was the data archive and distributor of the ESS data. The project is directed by a Central Co-ordinating team led by Roger Jowell at the Centre for Comparative Social Surveys, City University, UK.

An hour-long face-to-face interview includes, amongst others, questions on family, work and well-being, health and economic welfare. Information was recorded at an individual level and eligible participants were all persons aged 15 and over resident within private households regardless of their nationality, citizenship, language or legal status.

In the present study, data from the second round of the ESS edition 2.0 are used. It includes 24 countries for analysis: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine and United Kingdom.

Sampling design and sample size

Strict random probability methods were used at every stage of data collection in all countries. In Greece, in particular, the sample design included three stages: area units (average 40 households), households, and persons. In the first stage, area units, i.e. Primary Sampling Units (henceforth PSUs) were sorted into 90 strata. Greater Athens was divided into 31 geographical strata, Greater Thessalonica into 9 and the

rest of Greece into 50 strata, defined by the degree of urbanization and region (15 regions).[1]

Sample size was allocated to strata in proportion to the Census number of households. The sample size was then divided into PSUs, based on 5, 6, or 7 sample households per PSU, the number depending on the stratum. Within each stratum, PSUs were selected with probability proportional to size. The total number of sampled PSUs was 528. In the second stage, within each sampled area unit, interviewers made a complete listing of all resident households.

For all towns and cities, the interviewer was given a Census map clearly showing the area unit; for rural areas field supervisors created a rough map and description of the boundaries. The completed listing was passed to a field supervisor, who would then apply a random start and interval to select households systematically. At the third and last stage, one resident over 15 was selected at random using the Kish grid (Kish 1949).[2]

The minimum 'effective achieved sample size' was set to 1,500, after discounting for design effects, or 800 in countries with populations of less than 2 million. Thus, with the help of the sampling panel, each country determined the appropriate size of its initial issued sample by taking into account the realistic estimated impact of clustering, eligibility rates (where appropriate), over-sampling and response rate on the effective sample size. Greece reached a sample size of 2,406 individuals. The final sample size of each country is presented in Table 4.1:

[1] Greece is divided into 13 regions, but for the purpose of the ESS the region of Attica and Thessalonica is divided into 2 parts.
[2] The Kish grip is a method for choosing who to interview in each household in a random way.

Table 4.1: Net sample size

Country	*Frequency*
Austria	2256
Belgium	1778
Switzerland	2141
Czech	3026
Germany	2870
Denmark	1487
Estonia	1989
Spain	1663
Finland	2022
France	1806
United Kingdom	1897
Greece	**2406**
Hungary	1498
Ireland	2286
Iceland	597
Luxembourg	1635
Netherlands	1881
Norway	1761
Poland	1716
Portugal	2052
Sweden	1948
Slovenia	1442
Slovakia	1512
Ukraine	2031
Total	45700

Response rates

A minimum target response rate of 70% in each country had been specified. In order to increase the response rates the ESS set:

- Fieldwork period of at least one month, within a period of 4 months.
- Face-to-face briefing and training of all interviewers.
- Limited interviewer workloads (max. 24 issued sampling units).
- Face-to-face data collection.
- At least 4 visits/calls on different days and at different times.
- Visits spread over at least 2 different weeks.
- No substitution at any stage.
- The use of refusal conversion strategies.
- The use of detailed contact forms.
- Specified quality control back-checks.

Table 4.2 below gives the exact definition of response rate and calculates it for Greece:

Table 4.2: Breakdown of response and non-response in Greece

a)	Total number of issued sample units (addresses, households or individuals):	3056
b)	Refusal by respondent:	36
c)	Refusal by proxy (or household or address refusal):	446
d)	No contacts (after at least 4 visits):	112
e)	Language barrier:	16
f)	Respondent mentally or physically unable to co-operate throughout the fieldwork period:	9
g)	Respondent unavailable throughout the fieldwork period for other reasons:	9
h)	Address not residential (institution, business/industrial purpose):	0
I)	Address not occupied (not occupied, demolished, not yet built):	1
j)	Address not traceable:	0
k)	Other ineligible address:	0
l)	Respondent moved abroad:	1
m)	Respondent deceased:	0
n)	Number of achieved interviews:	2406
o)	Interviews not approved:	0
p)	Records in the data file:	2406
x)	Number of sample units not accounted for:	0
Response rate main questionnaire (n-o)/(a-(sum h,I,k,l,m)):		**78.78%**
Number of completed supplementary questionnaires:		2406

Questionnaire design – process

ESS has two questionnaires in every round: a) a face-to-face interview questionnaire and b) a short supplementary one that is self-completed or face-to-face, depending on the country. The interview questionnaire includes 'core' items, i.e. that remain constant at each round, and 'rotating' items, which vary from round to round.

The core questionnaire items cover a range of themes. Subjects covered include: public trust in government, politicians and institutions, political participation and orientation, moral, political and social values, social inclusion and exclusion, national, ethnic and religious allegiances, well-being, health and security, demographic composition, education and occupational background, financial circumstances and household circumstances.

The content of the rotating parts is determined via a call for proposal from multinational teams of social scientists. Round 2 contains a part on health care and services, which remains the main interest of this thesis. The aim of this part was to provide data with which to map the interrelationships between structure and culture regarding health and care seeking (Kooiker 2001).

The supplementary questionnaire includes two parts. The first contains questions on human values. The second contains repeat measures from the main interview questionnaire in order to determine measurement errors and reliability of the items. Finally, there were some additional country-specific questions for national use. In Greece, both the main and the supplementary questionnaire were completed through face-to-face interviews.

Data collection in Greece

The market research company OPINION SA, based in Athens, was responsible for the data collection in Greece and the funding agency was the National Centre of Social Surveys. The main fieldwork period was set to last for at least one month within a four-month period. The fieldwork period lasted from 10.01.05 to 20.03.05, with a pre-test period from 10.12.04 to 15.12.04. The fieldwork was conducted by 171 experienced interviewers, who received an ESS specific personal briefing. The first contact with potential respondents was face-to-face, with a minimum of 5 required visits per respondent.

Description of variables

This section describes the variables that will be used in the analysis. First, the dependent variable, i.e. non-adherence to prescribed medication, is explained. Then the explanatory variables are presented and a distinction is made between the main explanatory variables and the control ones. The variables described here generally refer to all country unless the particularities of Greece, the country of main interest, e.g. differences in the educational system, required different classification and converge of the categories. This is clearly stated whenever it is necessary.

Dependent variable

Non-adherence to medication was the main dependent variable. It was self-reported and was measured by asking the interviewee to "think back to the last time a doctor prescribed you a medicine you had not had before. Which statement comes closest to what you did with the prescription?" Seven options were given for a response:

a. I didn't collect the medicine from the pharmacy.
b. I collected the medicine but didn't use any of it.
c. I used some or all of the medicine but not exactly as prescribed.
d. I used the medicine exactly as prescribed.
e. Can't remember last occasion.
f. Never had prescription from doctor.
g. Other answer.

For the present study this variable was converted into a new one based on the assumption that any deviation from the doctor's suggestion is considered non-adherence to medication (Barber, Parsons et al. 2004). Therefore, the respondents are classified as 'non adherents' if they did not collect the medicine from the pharmacy, collected it but didn't use it, or used it but not exactly as prescribed (responses a, b and c). 'Adherents' are those responding that they used the medicine exactly as prescribed (response d). Finally, the rest of the responses were set as missing (responses e, f and g).

Explanatory variables

The main focus of the thesis –and this chapter in particular- is to examine how individuals' perceptions of the doctor-patient relationship affect their decision to non-adhere to prescribed medication. The ESS provides a number of questions that look at individuals' perceptions of this relationship. These questions are considered to be the main explanatory variables for the present analysis. Nevertheless, in addition to the impact of the doctor-patient relationship on non-adherence, the review of the empirical variables in the introductory part identified four more groups of determinants. These are demographic and socioeconomic factors, disease related factors, drug related factors and patient's beliefs on illnesses and medication (see

part 2.4.2 for more details). It is considered essential for the analysis to control for these factors.

However, this is a population survey, therefore some modifications and adaptations of the data are necessary. To start with, the survey has no available information on specific disease and regimen characteristics of the respondents. Hence disease and drug related data cannot be used. However, some variables can be used to identify the general state of health, such as self-reported health status and disability level. As far as individuals' beliefs on medication and illnesses are concerned there were not many questions in the ESS, but there was a question on fear of side-effects. Also, the ESS includes questions on health systems regarding choice and preferences over doctors. These factors, although they are rarely investigated in patient empirical studies, have been identified by the WHO (2003) as possible determinants of non-adherence. It will be interesting to examine their impact on the general population's decision to follow doctors' recommendations.

To sum up, the main cluster of explanatory variables that will be examined here are individuals' beliefs about the doctor-patient relationship. However, a number of control variables will also be considered. These include demographic and socioeconomic characteristics, self-reported health status, fear of side effects and health system related factors. Both explanatory and control variables are now described in more detail.

Perceptions of the doctor-patient relationship

The interaction between doctors and patients and the way individuals perceive it has been attracting the attention of many researchers during recent years. Evidence identifies a number of problems in the area. Expectations for communication and participation in the consultation (Jenkins, Britten et al. 2003), misunderstandings between the two parties (Britten, Stevenson et al. 2000) (Farber, Capra et al. 2003) and different agendas that are not met during the consultation (Barry, Bradley et al. 2000) are a few examples of the challenging aspects of the doctor-patient relationship that may lead to non-adherence to medication.

In ESS a number of questions asked individuals to show their agreement or not with the following statements (variable codes are given in parenthesis):

- "People can cure themselves without having to visit a doctor" (PPLCURE).
- "People rely too much on their doctors rather than themselves to keep healthy" (PPRLDC).
- "When people are sure about what medicine they need, their doctor should just prescribe it for them" (PSMDCPR).
- "I generally feel a bit disappointed when I leave a doctor's surgery without a prescription" (DSPLVPR).

Answers included: agree strongly, agree, neither agree nor disagree, disagree and disagree strongly and for the purpose of this thesis were merged into two categories: agree (including those who agree or agree strongly) and not agree (including those who disagree, disagree strongly and neither agree nor disagree).

Another cluster of questions assessing the population's beliefs about the doctor-patient relationship asked respondents to indicate how often they thought the following applies to doctors in general (variable codes are given in parenthesis).

- "Doctors keep the whole truth from their patients" (DCKPTRT).
- "GP's treat their patients as their equals" (DCTREQL).
- "Before doctors decide on a treatment, they discuss it with their patient" (DCDISC).
- "Patients are reluctant to ask their doctors all they'd like to ask" (PTNRLCQ).
- "Doctors are willing to admit their mistakes to their patients" (DCSDMMS).
- "Doctors use words or phrases that their patients find difficult to understand" (DCDFCWR).

Responses were: never or almost never, some of the time, half of the time, most of the time, always or almost always. Answers to the above question were merged into two categories: yes, the statement applies to doctors (including never or almost never and some of the time), and no, it does not (including all the other categories). The theoretical elements behind the questions were not stated clearly in the ESS. However, it seems that the questions are mainly testing elements of trust ("doctors keep the whole truth"), paternalism ("treat patients as equals") and shared-decision

making ("before doctors decide on a treatment, they discuss"). The last two questions look at doctors' sincerity and their ability to communicate effectively using simple words and phrases.

Control Variables

a. Demographic and socio-economic characteristics

As mentioned in the literature review (Section 2.4.2), the empirical studies examining socio-demographic factors as determinants of non-adherence to medication have led to contradictory results. Some studies report significant association of adherence with some of these factors (Buck, Jacoby et al. 1997; Faulkner, Young et al. 1998) while some other do not (Brus, van de Laar et al. 1999) (Lin, Von Korff et al. 1995).

Basic demographic measures used in this study were age (AGE), gender (SEX), marital status (MARITAL), domicile (URBAN), education (EDUC) and self-reported income (HINCFEL).

The question on marital status (MARITAL) included five categories: married, separated, divorced, widowed, never married. For the present analysis the variable was divided into married and not married (including 'separated', 'divorced', 'widowed' and 'never married') in order to examine whether people who have a partner behave in a different way.

Respondents were asked to describe the area they live by choosing one of the following categories: a big city, the suburbs or outskirts of a big city, a country village, a farm or a home in the countryside. For the present study the variable was dichotomised into urban ("big city" and "the suburbs or outskirts of a big city") and rural area ("country village", "farm or a home in the countryside"). This variable was coded as URBAN.

The question on education (EDUC) was a country-specific one, which was then coded into the ESS coding frame as follows (ESS standard):

0. Not completed primary education.
1. Primary or first stage of basic.

2. Lower secondary or second stage of basic.
3. Upper secondary.
4. Post secondary, non-tertiary.
5. First stage of tertiary.
6. Second stage of tertiary.

Education in Greece is obligatory in primary (6 years) and high school (3 years). Another 3 years of secondary education (lyceum) are non-compulsory. Non-tertiary education comprises national and private institutions for job-related skills providing entrance to the labour market. At the first stage of tertiary education there are Technological Educational Institutes (TEI), which were not equivalent to Universities till 2001 but have been under an equivalence programme since then. University degrees last for 4-5 years depending on the type of study. During the last ten years postgraduate departments have also been established leading to Masters and PhDs.

Education levels in the Greek part of the questionnaire were:

- Illiterate/not completed primary education (ESS standard = 0).
- Primary completed (ESS standard = 1).
- Partial secondary (ESS standard = 2).
- Full secondary (ESS standard = 3).
- Post secondary/polytechnic non-tertiary (ESS standard = 4).
- University first degree (ESS standard = 5).
- Post-graduate (Diploma/Master) (ESS standard = 6).
- Post-graduate (PhD) (ESS standard = 6).

For the analysis here, education levels were merged into three categories, primary (ESS standard 0 and 1), secondary (ESS standard 2, 3 and 4) and tertiary (ESS standard 5 and 6).

A subjective measurement of income (HINCFEL) was obtained by asking: "Which of the following descriptions...comes closest to how you feel about your household's income nowadays?"

- Living comfortably on present income.
- Coping on present income.
- Finding it difficult on present income.

- Finding it very difficult on present income.

For the analysis, categories remained unchanged.

b. Self-reported health status and subjective well-being

The ESS is a population study without information on specific diseases or the clinical condition of the respondents. However, overall information on the state of health, even self-reported is considered important to be included in the analysis. Individuals in worse health may differ not only in their attitudes towards medication but also in the way they perceive the doctor-patient relationship.

In the ESS one item was used to measure self-reported health state (HEALTH). The question asked individuals whether they would say their health in general is very good, good, fair, bad or very bad. The answers were merged into three: good, fair and bad.

A second item referred to disability (HLTHMP). Respondents were asked if they are hampered in their daily activities in any way by any longstanding illness, or disability, infirmity or mental health problem and if so, to what extent. Answers included: no, yes and yes to some extent and were merged into: yes or no.

c. Health system related factors

The literature on health services and non-adherence to medication is very restricted; however, in a study on hypertension it has been shown that confidence in the health care system as a whole led to better adherence (Kjellgren, Svensson et al. 1998). For this thesis two aspects regarding health systems were examined, i.e. choice (CHOICE) and preferences on specialised doctors (PRFSDC), as explained below.

People were asked if, when choosing a regular GP, they feel they have a) enough choice or b) not enough choice. This variable was treated as binary. Respondents were also asked whether they would prefer to see the same doctor for different everyday health problems. They could reply positively, negatively or express no preference either way. The variable was dichotomised here into those who would

prefer to see the same doctor and those who do not (including those with no preference).

d. Fear of side effects (FRSDEFF)

It was shown in the literature review of the empirical studies that there has been an increasing interest in peoples' views about illnesses and medication and how these views may influence adherence (Horne and Weinman 1999). The perception of the medication as either not needed or not effective (Boulet 1998; Johnson, Williams et al. 1999) as well as fears of side effects (Boulet 1998) were often mentioned as factors associated with non-adherence to prescribed medication.

The ESS included a question on fear of side-effects. Answers to the question "when you are prescribed a medicine how often do you worry about side-effects" were graded on a 5-point scale: never or almost never, some of the time, about half the time, most of the time and always or almost always. For the present analysis, the variable was merged into two categories, 'yes' (including categories 'most of the time' and 'always and almost always') and 'no' (including all the others).

Methods

This section presents the methodology followed in this chapter.

4.3.1 Preliminary analysis

The main explanatory variables looking at the population's perceptions on doctors and the fact that they may be highly correlated with each other generated concerns about collinearity. To check for possible correlation between the variables, a covariance matrix among the belief variables was computed. The absolute value of the correlations ranged from to 0.0017 to 0.39 and therefore associations between the variables were very low (see Appendix, Table A.1).

To test further for collinearity between the independent variables, the variance inflation factor (VIF) test was used. Collinearity is a problem among the independent variables and therefore the VIF test from an OLS regression model is

valid for a probit model with those variables. A regression model with the explanatory variables was run and the VIF was estimated to be 1.27.[3] The low value of the VIF test suggests that collinearity is not a concerning limitation in the interpretation of the empirical estimates.

In addition, a factor analysis of the correlation matrix was performed with the aim of reducing the main explanatory variables (Gorsuch 1983). More specifically, the purpose of the analysis is to identify if the observed variables can be explained largely or entirely in terms of a much smaller number of variables, called the factors. In the case of the main explanatory variables factor analysis aims to find whether there is a pattern in the way people think about their doctors and possibly identify a few factors that will explain their perceptions.

All the main explanatory variables, i.e. perceptions on the doctor-patient relationship, are included in the factor analysis and different types are tried including four, three, two and one factor solutions. The results (presented in Tables A2.1-A2.6 in the Appendix) fail to identify a simple pattern of relationship among these variables. Uniqueness is above 70%, indicating that the proportion of the common variance of the variable not associated with the factor is very high. In other words, the factor analysis fails to identify one (or more) factors that could replace the much larger number of the main explanatory variables. It also verifies that each of the belief variables is measuring a different aspect of the doctor-patient relationship.

The above results confirm that the variables showing beliefs about the doctor patient relationship do not associate highly, and that each of them is measuring different aspects of the relationship. Therefore the best approach would be to use all the main explanatory variables, i.e. the variables on people's perception about doctors, in the analysis.

4.3.2 Model specifications

The main concern of this chapter is to explain non-adherence to prescribed medication by the variables presented in the previous section (Section 4.2.2.2).

[3] Values of VIF higher than 10 indicate serious problem of collinearity (Belsley, Kuh et al. 1980)

Hence, non-adherence to medication is specified as a function of the previously defined variables and in its general form could be expressed in the following way:

$$y_i = x_i'\beta + \varepsilon_i \qquad (4.1)$$

where y_i is the dependent variable for observation i, i.e. self-reported non-adherence to medication, β is a $(k \times 1)$ vector of the unknown parameters, x_i is the $(k \times 1)$ vector of the explanatory variables, and ε_i is the error term with $\varepsilon_i \sim N(0, \sigma)$.

The dependent variable y is a binary variable where 0 stands for adherent and 1 for non-adherent respondent. The explanatory variables include the beliefs regarding the doctor patient relationship and a number of control variables. The main explanatory variables, beliefs regarding the doctor-patient relationship, are all binary variables (0=do not agree, 1=agree). The effect they are expected to have on non-adherence is explained below.

The effect of PPLCURE, PPRLYDC, PSMDCPR, DSPLVPR, PTNRLCQ, DCKPTRT and DCDFCWR is expected to be positive. In particular, if people believe they can cure themselves without visiting a doctor (PPLCURE) they are more likely to non-adhere to what the doctor recommends and so are those who believe that people rely too much on doctors (PPRLYDC).

Similarly, those who think that when they are sure about the medication they need the doctor should prescribe it (PSMDCPR) and those who feel disappointed when leaving a clinic without a prescription (DSPLVPR) are more likely to non-adhere. The reason for this is that both statements express individuals' expectations from the consultation that, if not met, is likely to lead to non-adherence to what the doctor suggested. Also, respondents who believe patients are reluctant to ask questions (PTNRLCQ), that doctors keep the truth from their patients (DCKPTRT) and that doctors use words that are difficult to understand (DCDFCWR) are more likely to non-adhere to what the doctor prescribes.

On the other hand, the effect of DCTREQL, DCDISC and DCADMMS is expected to be negative; when people believe that the doctor treats them as equals (DCTREQL), discusses the treatment with them before deciding on it (DCDISC)

and admits their mistakes (DCADMMS) are less likely to non-adhere than those who think the opposite.

Control variables include six demographic and socioeconomic factors: AGE (in years), SEX (0=male, 1=female), MARITAL (0=not married, 1=married), EDUC (0=primary education, 1=secondary, 2=tertiary), URBAN (0=rural, 1=urban) and HINCFEL (0=living comfortable at present income, 1=coping at present income, 2=find it difficult at present income, and 3=find it very difficult to cope).

As was shown in the review of the empirical studies (Section 2.2.2), the impact of the demographic and socioeconomic variables is ambiguous. The impact of age (AGE) is complex and in some studies it was shown to be negatively associated with non-adherence while it is positively associated in others. This may be attributed to the fact that age is an indicator of health and medication taking. Older people may be more likely to consume medication for serious and symptomatic conditions therefore may be less likely to non-adhere. On the other hand, age exerts some behavioural and perceptual effects, namely it influences people's memory loss, which may be a reason why people fail (unintentionally) to take their medication. It is therefore expected that the impact of age on non-adherence may be negative up to a point while it will be positive after this point. Hence, to examine this effect, a quadratic specification of age (AGESQR) is specified.

Marital status (MARITAL) is assumed to have a negative effect on non-adherence, i.e. married people are less likely to non-adhere. It is expected that individuals may be reminded by their partners to take their medication. URBAN is assumed to measure access to health care in a way, with those living in urban areas having better access than those in rural areas. Hence it is expected to have a negative effect on non-adherence, i.e. people who live in urban areas have better access to health care and consequently are less likely to non-adhere.

The effect of education (EDUC) is also ambiguous. On the one hand, more educated people may be more interested in or feel more confident about exercising control over their medication and therefore adhere more (Gorsuch 1983). On the other hand, more educated people may question their doctor's advice more, in which case a positive association of education with non-adherence is expected. Self-reported income (HINFEL) is assumed to have a positive effect on non-adherence; those

reporting they have difficulties coping on their present income are more likely to non-adhere.

Other control variables are self-reported health status HEALTH (0=good, 1=fair, 2=bad) and disability HLTHMP (0=no, yes=1). HEALTH is expected to have a negative effect on non-adherence, with people in worse health being less likely to non-adhere, as worse conditions with symptoms and pain will force people to comply. Similarly, disabled people are expected to be less non-adherent. Health system related factors include choice CHOICE (0=not enough, 1=enough choice) and preference for the same doctor for different conditions PRFSDC (0=no, 1=yes). Both CHOICE and PRFSDC are expected to have a negative effect on non-adherence, with those people who feel they have enough choice and prefer the same doctor for different conditions being less likely to non-adhere.

Before finally deciding on the appropriate model for the analysis, an important feature of the data merits attention. The dependent variable, which defines the nature of the model, is binary with 0 standing for 'adherent' and 1 for 'non-adherent' respondent. However, a third category, of those respondents who did not answer the question, could not remember, reported they had never had a prescription before or refused to answer was set as missing. Analysis with a probit model would be adequate if missing values were missing completely at random.

However, the question on non-adherence was self-reported and, what is more, it can be perceived by some respondents as a question judging people's behaviour (DiMatteo and DiNicola 1982). It is likely that some of the respondents refused to answer because they felt they were being judged for their behaviour. In addition, some of the respondents who did not recall the last time they were prescribed medication may have memory loss problems, an issue associated with non-adherence as well. All these elements raised considerations of sample selection and lead to a model specification that takes into account the information that may be hidden in missing values.

To correct for the potential bias due to the missing values of the dependent variable, a Heckman probit model with sample selection is used.[4] The model, proposed by Van de Ven and Van Praag (1981) is based on the Heckman selection model (Heckman 1979), where the dependent variable is binary. The model accounts for the differential likelihood that the respondents have answered the question (i.e. they are non-missing). The model consists of two relations. First there is the regression model:

$$y_i = x_i'\beta + \varepsilon_{1i} \tag{4.2}$$

and second there is the selection model:

$$z_i'\gamma + \varepsilon_{2i} > 0. \tag{4.3}$$

In the case of our model, observations for which y is missing are assumed not selected and those for which y is not missing are assumed selected. In the latter case the selection relation generates a value of 1. For the two relations above the following holds:

$$\varepsilon_{1i} \sim N(0,\sigma),$$

$$\varepsilon_{2i} \sim N(0,1),$$

$$\mathrm{Corr}(\varepsilon_{1i}, \varepsilon_{2i}) = \rho.$$

The model tests the correlation between the two relations that are used to predict the probability of two events; non-adherence and report of adherence (non-missing). When $\rho = 0$ the probit regression provides unbiased estimates, while when $\rho \neq 0$ the probit estimates are biased. In the presence of correlation the missing values affect the validity of being non-adherent. In this case, the model corrects for systematic differences between the two groups (missing and non-missing) so that the predicted probabilities for respondents do not have a selection bias. In other words, the probit selection model allows the use of information for the missing values, to

[4] An alternative to the Heckman sample selection model is the two-part model (Duan, Manning et al. 1983). There has been extensive debate in the literature regarding the choice between the two-part model and the sample selection model (Jones 2001). Leung and Yu (1996) used Monte Carlo simulations to compare these two differing methods and determined that the final choice depends on the empirical context. In general, the two-part model is more appropriate for sequential decisions or in cases where there is collinearity. None of these characteristics is present in our analysis therefore the Heckman sample selection is chosen for the analysis of our data. I am very grateful to Dr Marin Gemmill for bringing this point to my attention.

improve the estimates of the parameters in the regression model. It provides consistent, asymptomatically efficient estimates for all parameters in the model.

In our study, the regression model (equation 4.1) predicts non-adherence to medication and the selected model (relation 4.2) predicts whether people were selected, i.e. were not set as missing. The selection function contains a set of explanatory factors z_i which are a superset of x_i. It has been argued that when the same explanatory variables are used to predict both the regression and the selection function, the parameters are theoretically identified but this identification is too weak to be applied in practice (Wooldridge 2006). Hence, in our model z_i includes all x_i as well as another variable, INWTM, indicating the time that was needed to complete the questionnaire. It is checked that the time needed to complete the interview is associated with whether the respondent answered the question but not with whether they decided to adhere or not.

Three main models are analysed. In Model I only socioeconomic variables are included as explanatory factors of non-adherence. Gradually, all control variables are included in Model II and finally Model III includes all explanatory variables, and both control factors and beliefs about the doctor patient relationship. The aim is to compare the three models in order to identify the model that is a better predictor of the dependent variable, i.e. non-adherence to medication.

For the analysis of the above data the statistical package STATA ed.9 was used.

4.3.3 Weighting survey data

The European Social Survey is a population study and therefore needs to be weighted to correct for specific characteristics that may bias the analysis. Two basic weights were used during the analysis; the population weight and the design weight. The population weight corrects for differences in the population size among the participating countries and was calculated as:

pweight = (population aged 15 and over)/(net sample in data file)×10 000

The design weight, with which we adjust the observations, corrects for differences in the probability selection and was computed as the inverse of the inclusion probabilities:

$$dweight = \frac{1}{prob_1 \times ... \times prob_k}$$

This is an $n \times 1$ vector of weights, where k depends on the number of stages of the sampling design. The weights were rescaled such in a way that their sum equals n.

Both weights were provided by the ESS. In the case where only Greek data were analysed only the design weight was used. When analysis included all 24 countries, both the design and the population weights were used to correct for the differences in population sizes between the countries.

4.4 Results

This section presents the main results of the analysis of the ESS conducted for this thesis. It begins with a description of the main variables of the analysis for both the Greek and the European sample. A t-test is used to examine differences in means between the two samples in order to explore idiosyncratic differences between the Greek population and the Europeans in terms of their perceptions regarding the doctor-patient relationship. It then presents the results of the Heckman probit model with sample selection and shows the factors associated with non-adherence to prescribed medication among Greeks. Similar analysis was used for the European sample and results are compared to those of the Greek one.

4.4.1 Descriptive statistics

This section describes the main variables used for the analysis, beginning with the dependent variable and then the explanatory ones.

Dependent variable; non-adherence to prescribed medication

It is convenient, at this point, briefly to recall the definition of non-adherence used in the analysis. As 'non adherents' are denoted all respondents who either did not collect the medicine from the pharmacy, collected it but didn't use it, used it but not

exactly as prescribed and as 'adherents' those responding they used the medicine exactly as prescribed. Finally, the rest of the responses were set as missing.

The following figure (Figure 4.2) shows the mean non-adherence rates among the ESS countries. Greece reports particularly low non-adherence rates. It is the second most 'adherent' country after Portugal, with only 7% of Greek respondents stating they did not follow the doctor's prescription.

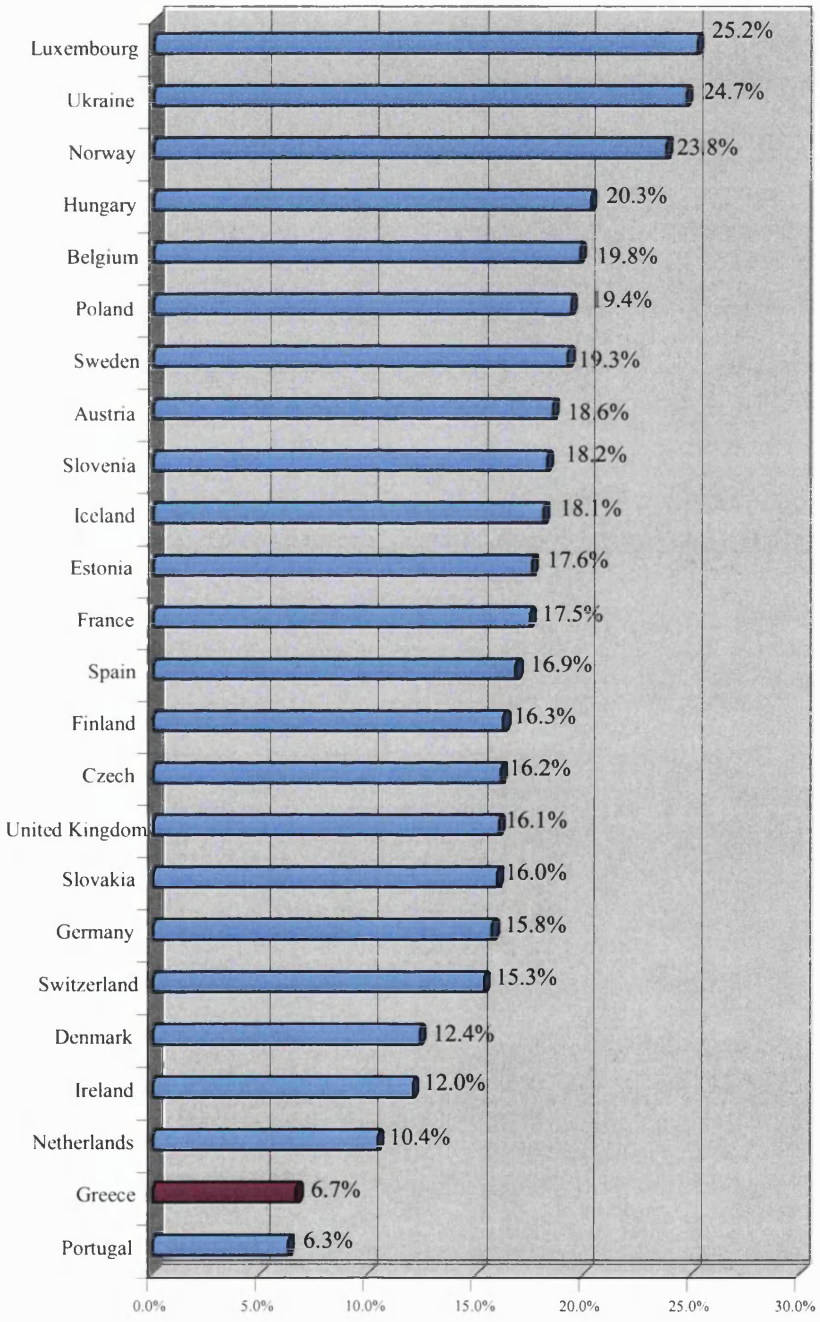


Figure 4.2: Mean non-adherence among European countries.

Figure 4.3 presents more analytically what Greeks did last time a doctor prescribed a medication they had never had before. It is clear that the vast majority of Greeks (82.4%) took the medication exactly as prescribed by the doctor. Only a small proportion (4.7%) used the medication but not exactly as prescribed, and an even smaller proportion did not collect the medication from the pharmacy (1.2%) or collected it but did not use it at all (0.8%).

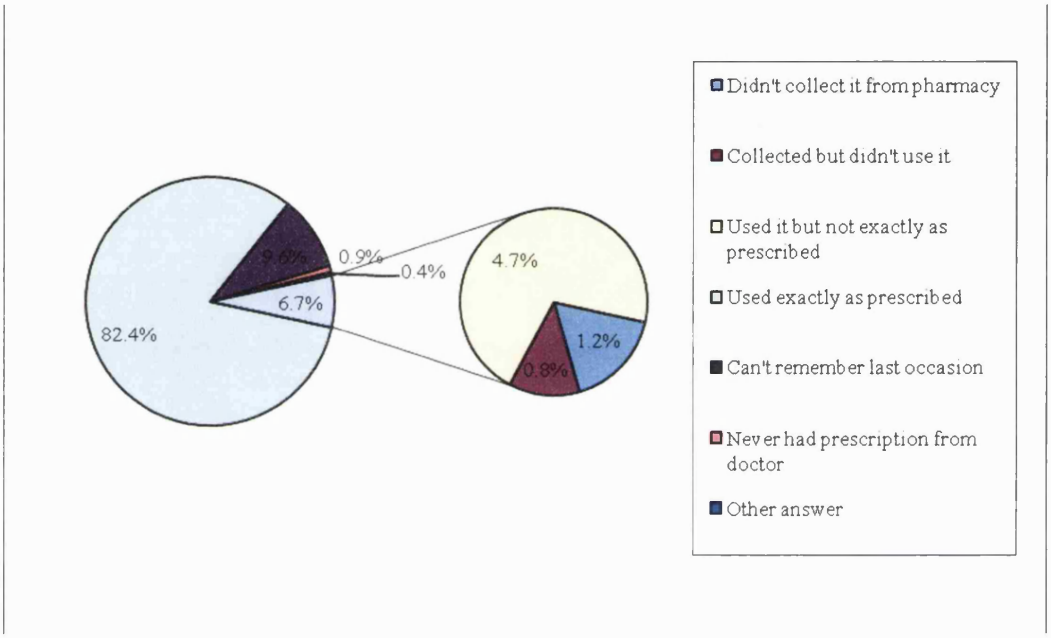


Figure 4.3: What did you do last time a doctor prescribed medication for you (Greece)?

Explanatory variables

Table 4.3 describes the main explanatory variables used in the analysis. These were: demographic and socioeconomic factors, health related factors, institutional factors and beliefs about the doctor-patient relationship.

The average age for the Greek sample is 50.9 years and 44% are women. Around 62% are married and this is significantly higher than the mean European average proportion, which is 55%. Thirty-eight percent had primary education, 48% had received secondary education and 12% had a University degree. It is also clear that Greece is a highly urbanised country, with over 56% of the sample reporting that they live in a big city or in the suburbs of one. There are also significant differences when it comes to self-reported income, with only 8.8% of Greeks feeling

comfortable on their present income, 40.9% reporting that they cope on the present income and 50.3% finding it difficult or very difficult to cope. Greeks, however, report being healthier than the average Europeans with 73.8% claiming good health while the respective proportion for Europeans is 65%. Levels of disability are also lower, with only 18% of the Greeks reporting being hampered in their everyday life due to disability.

Table 4.3: Description of variables

	ESS-24		GREECE	
	Mean	**St. Err.**	**Mean**	**St. Err.**
Demographic and socioeconomic factors				
age (years)	48.0677	0.1040	50.985	0.4281
sex (0=male 1=female)	0.4555	0.0029	0.4433	0.0113
married (0=not married 1=married)	0.5486	0.0028	0.6207	0.0110
education (0=primary education)	0.1841	0.0022	0.3864	0.0110
secondary	0.6187	0.0028	0.4857	0.0113
tertiary	0.1970	0.0023	0.1277	0.0075
urban	0.3145	0.0027	0.5654	0.0112
feeling about household's income (0=living comfortable)	0.2992	0.0026	0.0884	0.0064
coping at present income	0.4514	0.0028	0.4092	0.0111
difficult on present income	0.1862	0.0022	0.3652	0.0109
very difficult on present income	0.0630	0.0014	0.1370	0.0078
Health status				
health status (0=good)	0.6509	0.0027	0.7382	0.0100
fair	0.2662	0.0025	0.2074	0.0092
bad	0.0828	0.0016	0.0543	0.0051
disability (0=no, 1=yes)	0.2506	0.0025	0.1805	0.0087
Health system related factors				
choice regarding GP (0=not enough, 1=enough choice)	0.7184	0.0026	0.5659	0.0112
prefer same doctor (0=not same, 1=same)	0.7225	0.0026	0.4500	0.0113
Worried about side effects (0=no, 1=yes)	0.3412	0.0027	0.3341	0.0107
Doctor-patient relationship				
believe people can cure themselves *	0.8472	0.0020	0.7677	0.0096
believe people rely too much on doctors *	0.6564	0.0027	0.6109	0.0110
believe when people sure of medicine doctor should prescribe *	0.2805	0.0026	0.1815	0.0087
feel disappointed when leave without prescription *	0.0952	0.0017	0.0641	0.0055
believe doctors keep the whole truth **	0.1518	0.0020	0.2183	0.0093
believe doctors treat patients as equals **	0.4955	0.0029	0.4831	0.0113
believe doctors discuss treatment before they decide **	0.5475	0.0028	0.4919	0.0113
believe patients are reluctant to ask questions **	0.2519	0.0025	0.1883	0.0088
believe doctors admit their mistakes **	0.1116	0.0018	0.0832	0.0062
believe doctors use words patients find difficult to understand **	0.2872	0.0026	0.2736	0.0101
* 0=not agree, 1=agree ** 0=no & to some extent, 1=yes				

Regarding their views on health systems, Greeks do not believe they have enough choice in selecting their doctor. Only 56% of the Greeks feel they are given enough choice, while the equivalent proportion of Europeans is 72% ($t = 19.43$, $p<0.001$). Also, Greeks prefer visiting different doctors for different health problems while the majority (72%) of the Europeans opt for the same one ($t=29.43$, $p<0.001$). This may reflect the fact that, as explained in Section 2.5.2 of the thesis, there is a plethora of specialists in Greece and no gate-keeping system.

Particular attention is paid to what people think of doctors in order to identify possible idiosyncratic differences between Greeks and the rest of the Europeans. T-test is used to compare differences in the means. There is a clear tendency of the Greek respondents to rely on doctors more than the rest of the Europeans. They are less likely than the rest of the Europeans to believe that people can cure themselves without visiting the doctor ($t=10.89$, $p<0.001$). In a similar way, the proportion of Greeks that believe people sometimes rely too much on doctors rather than themselves to keep healthy is significantly smaller than the ESS average (60% and 67% respectively; $t=6.069$ and $p<0.001$).

In terms of the prescription of medicines, a similar tendency is observed with Greeks showing more trust of doctors than do Europeans. Only 19% of the sample believe that when people are sure of the medicine they need, doctors should prescribe it to them, while the proportion of Europeans who agree with this statement is 28% ($t=9.07$, $p<0.001$). A possible explanation may be that Greeks put more weight on their doctor's opinion than the other Europeans, when they are prescribed medication. This may also explain why they are less disappointed than Europeans when they leave the doctor's clinic without a prescription (6% and 10% respectively; $t=4.669$ and $p<0.001$).

As far as doctors telling the truth and admitting mistakes is concerned the picture is quite different. Greeks are more likely to believe that the doctors keep the whole truth from their patients than the rest of the Europeans (22% and 15% respectively) and this was statistically significant ($t=-8.5455$, $p<0.001$). Regarding doctors' errors Greeks believe less strongly than Europeans that doctors are willing to admit their mistakes to the patients (8% in comparison to 10% for the Europeans, $t=3.9653$ and $p<0.001$). However, no statistically significant difference is observed in the way the

two samples think of the doctor's communication skills, in terms of using words and phrases that patients find difficult to understand (t=0.1857, p<0.37).

In terms of equal treatment and discussion during the consultation, distinctions are less clear. When asked whether they believe that doctors discuss a treatment with their patients before they decide on it, Greek respondents are less likely to agree with the statement than the other Europeans (49% and 55% respectively with t=6.5738 and p<0.001). On the other hand, Greeks also report that they are less reluctant (19%) than the Europeans (25%) to ask their doctors what they want (t=6.852, p<0.001). Finally, there is no significant difference in the way Greeks and the other Europeans feel about doctors treating their patients as equals (t=1.783, p=0.0745).

To sum up, there is a tendency for the Greek population to rely more on their doctor's advice when it comes to treating a condition even if this is just a common cold. They also show a clear preference for not treating illnesses alone but following the doctor's recommendation. There are also some hints to support the opinion that the doctor-patient relationship is perceived by Greeks as a paternalistic one. Greeks are less likely to believe that doctors discuss the treatment with their patient before they decide. They also believe, even more strongly than the rest of the Europeans, that doctors keep back the whole truth.

The impact of the above explained differences and similarities in the explanatory variables between the ESS and the Greek sample will be examined through the regression results which follow.

4.4.2 Determinants of non-adherence

This stage of the analysis looks for the association between non-adherence and the explanatory variables by using the Heckman probit model with sample selection. It first presents the findings of the analysis from Greece that is of main interest in this thesis. It then presents results from all 24 European countries to discuss similarities and differences in the determinants. For purposes of clarity, results from the selection model are omitted and only the rho (ρ) and its p-value will be reported

here. More detailed results of the selection models, including tables with beta coefficients are presented in Appendix A3.1 and A3.2.

4.4.2.1 Results from the Greek sample

Three main models are compared here and presented in Table 4.4. In Model I only socioeconomic variables are included as explanatory factors. Progressively, all control variables are included in Model II and finally Model III includes all the explanatory variables, all control factors and the beliefs about the doctor patient relationship. The tables present the marginal effects (indicated in the text by mfx) which are more meaningful than the beta coefficients and easier to interpret.

In general, Model III, which includes all the control and explanatory variables, is the best predictor of non-adherence (log-likelihood was -354.68 as compared to -524.69 and -444.75 for Models I and II). In other words, perceptions about doctors along with the control variables constitute the model that better explains non-adherence to prescribed medication.

In addition, the model indicates that there is sample selection in all 3 models (Model I: $\rho = 5.513$, $p<0.001$, Model II: $\rho = 1.582$, $p<0.001$ and Model III: $\rho = 1.436$, $p<0.05$). Results confirm that the Heckman probit model with sample selection was the most appropriate model for the analysis.

Table 4.4: Factors associated with non-adherence - all models / Greece

	Model I	Model II	Model III
	Marginal Effects	Marginal Effects	Marginal Effects
Socio-demographic factors			
age squared (years)	-0.00001	-0.000017	3.43E-06
age (years)	0.00039	0.00012	-0.0020
sex (0=male 1=female)	0.0223*	0.0286**	0.0206*
married (0=not married 1=married)	-0.0007	0.0019	0.0081
education (0=primary education)			
secondary	-0.0046	-1.77E-06	0.0043
tertiary	-0.0231	-0.0255	-0.0150
urban	-0.0161	-0.0145	-0.0207
feeling about household's income (0=living comfortable)			
coping at present income	0.0055	0.0064	-0.0006
difficult on present income	0.0014	-0.0037	-0.0042
very difficult on present income	0.0241	0.0173	0.0045
Health status			
health status (0=good)			
fair		0.0482*	0.0434*
bad		0.0221	0.0241
disability (0=no, 1=yes)		-0.0024	0.0014
Institutional factors			
choice regarding GP (0=not enough, 1=enough choice)		-0.0114	-0.0140
prefer same doctor (0=no, 1=yes)		-0.0121	-0.0059
Worried about side effects (0=no, 1=yes)		0.0008	-0.0129
Doctor-patient relationship (I believe..)			
..people can cure themselves (0=not agree, 1=agree)			0.0231*
..people rely too much on doctors (0= not agree, 1=agree)			0.0037
..if people sure of medicine doctor should prescribe (0=not agree, 1=agree)			0.0247
..feel disappointed when leave without prescription (0=not agree, 1=agree)			0.0243
..doctors keep the whole truth (0=no, 1=yes)			-0.0115
..doctors treat patients as equals (0=no, 1=yes)			0.0170
..doctors discuss treatment before they decide (0=no, 1=yes)			-0.0252**
..patients are reluctant to ask questions (0=no, 1=yes)			0.0332*
..doctors admit their mistakes (0=no, 1=yes)			0.0131
..doctors use difficult words (0=no, 1=yes)			0.0165
Log pseudolikelihood	-524.6968	-444.7568	-354.6829
athrho	5.51373***	.58209***	1.4367*
*p<0.05; **p<0.01; ***p<0.001			

Perceptions about doctors, the main explanatory variables, were strong predictors of non-adherence. Table 4.5 describes in more detail results for Model III as this is the most involved model of the three and the one we are mainly interested in.

Table 4.5: Factors associated with non-adherence Model III / Greece

	Marginal Effects	Stand. Error	P>t	95% C.I.	
Socio-demographic factors					
age (years)	0.000003	0.00002	0.8450	-0.000031	0.000038
age squared (years)	-0.0020	0.0018	0.2540	-0.0056	0.0015
sex (0=male 1=female)	0.0207	0.0118	0.0790	-0.0024	0.0437
married (0=not married 1=married)	0.0081	0.0117	0.4880	-0.0148	0.0311
education (0=primary education)					
secondary	0.0043	0.0147	0.7680	-0.0245	0.0332
tertiary	-0.0150	0.0194	0.4380	-0.0529	0.0229
urban	-0.0207	0.0126	0.1000	-0.0454	0.0040
feeling about household's income (0=living comfortable)					
coping at present income	-0.0007	0.0197	0.9730	-0.0392	0.0379
difficult on present income	-0.0043	0.0196	0.8280	-0.0427	0.0342
very difficult on present income	0.0045	0.0234	0.8470	-0.0413	0.0503
Health status					
health status (0=good)					
fair	0.0434	0.0260	0.0940	-0.0075	0.0943
bad	0.0241	0.0458	0.5980	-0.0656	0.1138
disability (0=no, 1=yes)	0.0014	0.0211	0.9470	-0.0399	0.0427
Institutional factors					
choice regarding GP (0=no, 1=yes)	-0.0140	0.0120	0.2450	-0.0376	0.0096
prefer same doctor (0=no, 1=yes)	-0.0060	0.0116	0.6060	-0.0288	0.0168
Worried about side effects (0=no & to some extent, 1=yes)	-0.0129	0.0113	0.2520	-0.0350	0.0092
Doctor-patient relationship					
believe people can cure themselves *	0.0231	0.0117	0.0490	0.0001	0.0461
believe people rely too much on doctors *	0.0037	0.0111	0.7370	-0.0181	0.0256
believe when people sure of medicine doctor should prescribe *	0.0248	0.0158	0.1170	-0.0062	0.0558
feel disappointed when leave without a prescription *	0.0244	0.0251	0.3320	-0.0249	0.0736
believe doctors keep the truth **	-0.0115	0.0124	0.3530	-0.0359	0.0128
believe doctors treat patients as equals **	0.0171	0.0121	0.1600	-0.0067	0.0408
believe doctors discuss treatment before they decide **	-0.0252	0.0117	0.0310	-0.0482	-0.0023
believe patients are reluctant to ask questions **	0.0333	0.0175	0.0560	-0.0009	0.0675
believe doctors admit their mistakes **	0.0131	0.0220	0.5500	-0.0299	0.0562
believe doctors use words patients find difficult to understand **	0.0166	0.0131	0.2050	-0.0090	0.0422
* 0=not agree, 1=agree					
** 0=no & to some extend, 1=yes					

Respondents who believe that people can cure themselves without consulting a doctor are 2.3% more likely to non-adhere to the prescribed medication when given

some (p=0.049). When people do not consider it necessary to visit a doctor they are more likely to follow his recommendations when they see one.

Also, those respondents who believe that patients are reluctant to ask questions are 3.3% more likely to non-adhere (p=0.056). Two possible explanations can be given here. First, it is possible that, when people do not ask the doctor to provide what they want, they may leave the consultation with confusion regarding their medication. Misunderstanding of medication was associated with decreased adherence in a study by Farber et al. (2003). Secondly, reluctance to ask questions may be an indication of an authoritarian doctor-patient relationship where the doctor prescribes and does not allow the patient to address other issues. Unvoiced patient's agenda items led to reduced adherence rates in a study by Barry et al. (2000).

On the other hand, people who think that doctors who discuss the treatment before they decide on it are 2.5% less likely to non-adhere to the recommendation than those who believe the opposite (p=0.031). This is an important finding indicating that involvement in the decision making process affects non-adherence to medication. This finding supports previous empirical evidence, such as the study by Jenkins et al. (2003) in GP practices in the UK.

In view of the significance of the belief factors, we checked for the interaction effects between some socio-demographic variables and a number of perceptions regarding the doctor-patient relationship and their impact on the analysis. In particular we looked at the interaction between age and 'believe doctors discuss treatment before they decide', age and 'believe doctors treat patients as equals', secondary and tertiary education and 'believe doctors discuss treatment before they decide', age and 'doctors use difficult words', education and 'doctors use difficult words'. The results did not provide any significant findings and are presented in Appendix A (Tables A4.1-A4.8).

We now consider the effect of the control variables. Of the socio-demographic factors only sex is associated with non-adherence in all three models, with women being about 2% more likely to non-adhere than men. From the remaining control variables only health status is shown to be statistically significant. Those respondents that reported fair health status are 0.4% more likely to non-adhere than those in good health. Our initial expectation that people in worse health are less

likely to non-adhere, due to the severity of the condition, is not confirmed. However, our findings are not really contradictory with previous evidence. Severity of condition is not always related with better adherence (Mann, Eliasson et al. 1992) even in conditions with severe symptoms, as in rheumatoid arthritis (Brus, van de Laar et al. 1999). Therefore, a possible explanation of our findings here could be that people in worse health are using a larger number of drugs and possibly more complicated regimen therefore are more likely to non-adhere.

Finally, despite extensive evidence from the literature (Berman, Epstein et al. 1997; Newton, LaCroix et al. 1997; Grant, Devita et al. 2003) the analysis shows that fear of side-effects is not a significant factor in non-adherence, in any of the three models.

4.4.2.2 Results from the European sample

Similar analysis is conducted for the European sample (all 24 countries, including Greece). A Heckman probit model with sample selection is used to identify factors associated with non-adherence to medication among the Europeans. Data is clustered by country and a dummy variable of the countries is also introduced to control for differences among them. Then, results of the two samples (Greek and European) are compared to identify any similarities and/or differences.

Table 4.6 presents the marginal effects and their level of significance for all three models for the ESS sample. Similar to the Greek sample, in the European one Model III better explains non-adherence to the prescribed medication.

Most of the main explanatory variables, i.e. perceptions regarding the doctor-patient relationship, are strong predictors of non-adherence to medication in the European sample. Those more likely to non-adhere are respondents who believe that people rely too much on doctors (mfx=0.0222, $p<0.001$) and that when people are sure of medicine the doctor should prescribe it (mfx=0.0331, $p<0.001$). Similarly, those who are disappointed when they leave without a prescription (mfx=0.0436, $p<0.001$), those who feel that doctors keep the whole truth (mfx=0.0259, $p<0.05$) and those who feel people are reluctant to ask questions (mfx=0.0144, $p<0.05$) are more likely to non-adhere to prescriptions. On the other hand, those who believe that

doctors treat patients as equals (mfx=-0.0412, $p<0.001$) and discuss the treatment with the patient before they decide (mfx=-0.0301, $p<0.01$) are less likely to non-adhere. The latter finding indicates that the nature of the perceived asymmetry of information appears to be an important factor affecting patients' adherence.

Another interesting finding arising from the analysis of the European sample is the effect that institutional factors have on respondents' decision to non-adhere. These results are particularly valuable in view of the limited evidence in the area. More specifically, choice has a significant effect on people's decision to follow recommendations. Those Europeans who felt they have enough choice are less likely to non-adhere (mfx=-0.0373, $p<0.001$ for Model II and mfx=-0.0322, $p<0.001$ for Model III).

A possible explanation lies in what the review of the theoretical models, in Section 2.3, defined as 'perceived control'. Being able to choose the doctor may be perceived by the individuals as a way of having control over their own care. Another possibility may be the fact that more choice improves satisfaction with the consultation and consequently may lead to better adherence to recommendations. Indeed, some evidence supports this explanation as it shows that the patient's opportunity to select their personal physician may influence subsequent satisfaction with recommendations (Schmittdiel, Selby et al. 1997).

Table 4.6: Factors associated with non-adherence- all models / ESS-24

	Model I	Model II	Model III
	Marginal Effects	Marginal Effects	Marginal Effects
Socio-demographic factors			
age squared (years)	-0.000033***	-0.000026**	-0.00002*
age (years)	0.001961	0.00098	0.0005
sex (0=male 1=female)	0.017675*	0.0194*	0.0205*
married (0=not married 1=married)	-0.02486***	-0.0252***	-0.0234**
education (0=primary education)			
secondary	0.013082	0.0100	0.0131
tertiary	0.012861	0.0055	0.0217
urban	0.012113*	0.0153*	0.0121
feeling about household's income (0=living comfortable)			
coping at present income	-0.00976	-0.0074	-0.0106
difficult on present income	0.010772	0.0226*	0.0103*
very difficult on present income	0.015532	0.0217*	0.0011
Health status			
health status (0=good)			
fair		-0.0060	-0.0007
bad		-0.0252***	-0.0220*
disability (0=no, 1=yes)		0.0198	0.0210
Institutional factors			
choice regarding GP (0=not enough, 1=enough choice)		-0.0373***	-0.0322***
prefer same doctor (0=no, 1=yes)		-0.0373	-0.0312
Worried about side effects (0=no & to some extent, 1=yes)		0.0142	0.0091
Doctor-patient relationship (I believe...)			
..people can cure themselves (0=not agree, 1=agree)			0.0048
..people rely too much on doctors (0= not agree, 1=agree)			0.0222***
..if people sure of medicine doctor should prescribe(0=not agree, 1=agree)			0.0331***
..feel disappointed when leave without prescription (0=not agree, 1=agree)			0.0436***
..doctors keep the whole truth (0=no, 1=yes)			0.0259*
..doctors treat patients as equals (0=no, 1=yes)			-0.0412***
..doctors discuss treatment (0=no, 1=yes)			-0.0301**
..patients are reluctant to ask questions (0=no, 1=yes)			0.0144*
..doctors admit their mistakes (0=no, 1=yes)			0.0004
..doctors use difficult words (0=no, 1=yes)			0.0049
Log pseudolikelihood	-20536.34	-16788.87	-13186.09
athrho	0.6446848	0.2468262	0.3122342**
*p<0.05; **p<0.01; ***p<0.001			

From the socio-economic factors some interesting findings are shown. Female Europeans are more likely to non-adhere than men and this is constant in all three

models. Female gender was also a predictor of non-adherence in the Greek sample as well. On the other hand, age, marital status and self-reported income were not significant predictors in the Greek sample but they are in the European. Age is not significant, yet age squared is negatively associated with non-adherence in all three models indicating that after a certain age people are less likely to non-adhere. These results are not inconsistence with previous evidence where older people have been shown to adhere more to recommendations (Bloom 1998; Buck Jacoby et al. 1997).

Married respondents are about 2% less likely to non-adhere in all three models, indicating that having a spouse increases adherence rates. A possible explanation may be that support by the partner may help the individual remember to take the medication. Indeed, Morse et al. (1991) in a study among HIV patients in the USA showed that living with someone else was associated with improved adherence rates.

Analysis also reveals that those who reported lower income were more likely to non-adhere. The literature has shown that lower income is associated with primary non-adherence, i.e. patients not having their prescription filled in the pharmacy (Jones and Britten 1998). However, lack of information on prescription costs in the ESS does not permit such an analysis here.

In contrast with the Greek sample, those Europeans reporting worse state of health are less likely to non-adherence. Severity of a condition has been reported to be related to better adherence, yet evidence is not always confirmed.

A number of interaction effects of health status with health beliefs were tested to reveal any hidden determinant of adherence, and results are presented in appendix A. In particular, we tested the interaction effect of health with a) the belief that "people can cure themselves" (Table A4.9), b) the belief that "people rely too much on doctors" (Table A4.10), c) the belief that "doctors treat patients as equals" (Table A4.11) and d) the belief that "doctors discuss with patients before they decide on the treatment" (Table A4.12). Only the first of the above interaction effects was shown to be significant, indicating that people in worse health who believe that they can cure themselves are more likely to non-adhere.

To sum up, the European sample showed similar findings to the Greek one. The belief factors are the most significant predictors of non-adherence in both the Greek

and the European sample. Two of these factors are common in both samples and these are discussion of the treatment and being reluctant to ask questions. In general the analysis verified that people's views of doctors influence their decision on whether to take the prescribed medication or not.

4.5 Limitations

The ESS provided a solid foundation for a statistical analysis of the issues which concern this thesis. It is a unique opportunity of a large scale dataset that allows for the issue of doctor-patient relationship and adherence to medication to be examined at a population level. This section discusses the limitations of the study, which will facilitate the discussion of the results before final conclusions are drawn.

One drawback of this study is that it was based on secondary data and therefore we had no influence over the design of the questions or other methodological issues. First, the measurement of non-adherence to prescribed medication was restricted to only one question. Non-adherence was self-reported and the timing of drug consumption to which the question was referring was rather vague. Nevertheless, the ESS is, to our knowledge, the only multinational survey that included a question on non-adherence to prescribed medication as well as questions on the perceptions of the doctor patient relationship. Hence, it provided a unique opportunity to examine the issue at a population level and make cross-country comparisons.

Another problem that arose as a result of the secondary analysis was the lack of a clear conceptual framework behind the choice of the particular questions, especially the ones on people's perceptions regarding the doctor-patient relationship. In general, the variables chosen covered the main areas identified in the literature of non-adherence and the ones that this study intended to investigate.

Another study limitation was the lack of data about prescription costs. This type of data would have allowed one to examine whether cost was a predictor for not filling the prescription and maybe identify any potential difference between primary non-adherence, i.e. the actual non-redeeming of the prescription and secondary non-adherence, i.e. whether patients take their drug as intended by the prescribing doctor (Jones and Britten 1998). Any attempt to correct for this limitation by introducing

average prescription costs per country would be misleading as there are several exemptions that depend, among others things, on an individual's income or health condition.

4.6 Discussion and policy implications

This section discusses the findings of the analysis of the ESS, with respect to the hypothesis and the research questions set. A more broad discussion as well as policy implications are considered in Chapter 7, along with all the findings of the thesis.

Q1: *What do Greeks believe about their doctors' role in prescribing and treatment of illnesses? What are their general attitudes towards medicines?*
Q2: *To what extent do these beliefs and attitudes differ from those of other Europeans?*

Non-adherence rates in Greece are shown to be very low. Greeks are the second most adherent Europeans after the Portuguese, with only 7% reporting that they did not take their medication exactly as prescribed by their doctor. Before rushing to conclusions, we consider whether a possible explanation may lie in the definition of non-adherence used in this study. Respondents were defined as 'adherents' or 'non-adherents' based on their attitudes towards *prescribed* medication. The Greek health system allows for some types of medicine, such as antibiotics, to be bought over the counter without a doctor's prescription. As a result, one could argue that Greek patients would prefer to treat conditions, such as the common cold, without consulting a doctor and they would seek a prescription in more serious situations when they are more determined to adhere.

However, the above explanation does not seem to be actually supported by our empirical findings. When asked to comment on whether "people can cure themselves without having to visit a doctor" and on whether "people rely too much on their doctors rather than themselves to keep healthy" the Greeks appeared to credit doctor's expertise significantly more than the other Europeans. Even in questions referring to less serious conditions, such as the common cold, they agreed

that people can cure themselves but, again, they did so to a lesser extent than the other Europeans.

The above, therefore, indicates that although the system allows Greek patients to buy some types of medication without prescription from a doctor, it seems that they still count on doctors' advice more than the other Europeans do. Therefore, the definition of adherence employed in this analysis may indeed partly account for the low adherence rates. However, there is not enough evidence to conclude that this is the main reason explaining why Greece is in the lowest positions in the non-adherence rating.

On the contrary, what the analysis identified as strong predictors of adherence among Greeks was their relationship with doctors. On people's views of the doctor's role in consultation, evidence indicates that Greeks show a clear tendency to respect and trust doctors' advice significantly more than other Europeans do. Both in terms of treatment of illnesses and prescription of medication, the doctors' opinion has greater weight with Greek patients. One explanation lies in the nature of the relationship. Indeed, there is some evidence suggesting that the doctor-patient relationship is perceived as a paternalistic one, as Greeks were significantly less likely to believe that doctors discuss on the treatment with the patient before they decide on it.

Q3: *How do individuals' beliefs about doctors affect their decision to adhere to prescribed medication?*

The analysis of the survey shows interesting results and confirms that perceptions individuals hold regarding doctors affect their decision to adhere to prescribed medication. This was shown in both the Greek and the European sample, where the model that included the belief factors was the one explaining non-adherence to medication better than the ones that included only control variables.

More specifically, in the Greek sample the way that individuals perceive the doctor's role and the doctor-patient relationship were shown to be the most significant predictors of non-adherence to the prescribed medication. More likely to non-adhere are those who believe that people can cure themselves without visiting a doctor and those who think that patients are reluctant to ask the questions they want. Also, those

less likely to non-adhere are the respondents who believe doctors discuss the treatment with the patient before they decide on it. Therefore, in the Greek sample, self-efficacy and involvement in the decision making process were the strongest predictors of non-adherence to the doctors' prescribed recommendations.

Of the control variables in the Greek sample, the only predictors of non-adherence were female sex, living in a rural area and reporting fair health status. Other demographic and socioeconomic factors, institutional variables and fear of side-effects did not significantly predict non-adherence.

In the European sample, again the strongest determinants of non-adherence were the perceptions of the doctor-patient relationship. More specifically, predictors of non-adherence were the beliefs that people rely too much on doctors to keep healthy, that when patients are sure of the medicine they need doctors should prescribe it, that they are disappointed when leaving the clinic without a prescription, and that patients are reluctant to ask the questions they want. On the other hand, the beliefs that doctors treat patients as equals and that they discuss before they decide on the treatment were negatively related with non-adherence.

From the control variables, the most interesting results given the lack of relevant evidence is the impact of institutional factors, i.e. the ability to choose a doctor. Other control variables predicting non-adherence were not being married and reporting lower income. Finally, fear of side-effects was not shown to be a significant factor related to non-adherence to medication.

Comparisons with results of the analysis of the European sample revealed idiosyncratic differences between Greeks and Europeans in terms of what they think of their doctors and how this influences non-adherence to medication. However, and despite the particular differences, both the Greek and the European analysis showed that beliefs about the doctors and the doctor-patient relationship were the strongest predictors of non-adherence to medication. Socioeconomic factors were not strong predictors of non-adherence, neither in the Greek nor in the European sample.

Hence, it seems that putting the issue of non-adherence and the doctor patient relationship in the country context allows a better understanding. This confirms the

first hypothesis of the thesis (**H1**), that the country context within which the issue of non-adherence is examined plays an important role in its understanding.

From a policy perspective, the findings confirm that non-adherence to medication should not be considered a patient-driven problem only. This traditional misconception dominated the literature for a long time. However, more recent evidence has shown that the typical non-adherent individual does not have specific demographic and socioeconomic characteristic. Individuals' beliefs and perceptions are important determinants of non-adherence and this needs more attention when interventions are designed.

The results of this chapter indicate that the system within which the issue of non-adherence is examined is important in its understanding. The doctor-patient relationship, and more specifically the way it is perceived by the individuals, is a strong predictor of their decision to follow prescribed recommendations. Institutional factors, including more choice and preference of same doctor, were also shown to affect adherence to medication and need to be taken into consideration when appropriate policies are built.

4.7 Conclusions

In this chapter we have drawn upon an empirical examination of a widely representative database, the ESS, to explore the underlying determinants of individuals' adherence to mediations, especially to disentangle the role of the doctor- patient relationship.

In particular, we have explored the Greek population's beliefs and attitudes towards medication, to see how they differ from those of other Europeans, mainly to identify predictors of non-adherence to prescribed medication. Despite its limitations, the ESS is one of the very few attempts systematically to collect data on medicine taking and the doctor-patient relationship from a large number of countries on a population basis. Hence, it provides a unique opportunity to study the issue of non-adherence within a country context.

The study demonstrated that Greeks show particularly high adherence rates to prescribed medication. It was also shown that the generally good opinion that the

individuals have about the role of the doctors in the treatment of illnesses was an important factor influencing their decision to adhere to the prescribed recommendations. In particular, involving patients in the decision making process and allowing them to ask questions were significant predictors of non-adherence to medication both in the Greek and the European sample. Other aspects of the doctor-patient relationship that predicted non-adherence were the belief that people can cure themselves without visiting a doctor and that people rely too much on doctors. Finally, treating patients as equals was negatively related to non-adherence.

Also, a significant predictor of non-adherence was the way people perceive the doctor's role in prescribing. Non-adherence increased with the belief that when people are sure of the medicine they want the doctor should prescribe it, as well as with the disappointment of leaving the doctor's clinic without a prescription.

Institutional factors were also significant predictors of non-adherence among the European sample. Being able to choose the doctor was a significant predictor of better adherence. On the other hand, results on the impact of socioeconomic variables on individuals' decision to non-adhere were not consistent.

The findings support the opinion that, irrespective of the disease characteristics or the specific circumstances of a consultation, the doctor-patient relationship remains one of the key issues in the problem of non-adherence. They support further and even more strongly the need for better doctor-patient relationships as the basis of any intervention that intends to help patients follow recommendations. Key points that contribute to a good atmosphere and improve adherence were shown to be involvement in the decision making process and treating patients as equals.

CHAPTER 5

NON-ADHERENCE AND DOCTOR-PATIENT RELATIONSHIP; A PATIENT SURVEY

5.1 Introduction

Chapter 4 of the thesis examined how the general perceptions that individuals have regarding the doctor's role in prescribing and treatment have an impact on their decision to adhere to prescribed medication. The findings revealed there is a strong association between what people think of doctors and their attitude towards medication. In Greece in particular, individuals seem to think highly of their doctors, and weight their opinion more than the rest of the Europeans do. These beliefs were the strongest determinants of individuals' decision to follow prescribed medication both for the Greek and the European sample.

Having studied the issue of non-adherence within the broad country context, it remains to be examined whether similar beliefs and attitudes are observed within specific disease groups in Greece. This is the objective of Chapter 5, which focuses on a group of hypertensive patients in Greece. In particular, the aim is to examine how the way patients perceive the doctor's communicative behaviour and role during the consultation has a direct effect on patients' decision to adhere to medication (Figure 5.1).

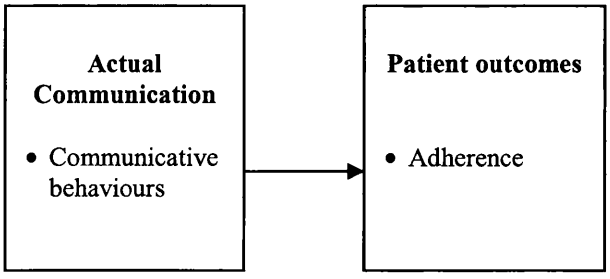


Figure 5.1: Association between actual communication and outcomes.

Why hypertension?

Hypertension is a condition for which adherence is particularly important. Untreated hypertension can lead to serious complications, increasing the risk of cardiovascular diseases and stroke. Cessation of beta-blocker use was found to be a predictor of angina and myocardial infarction in hypertensive patients in the USA who had no prior history of coronary heart disease (Psaty, Koepsell et al. 1990). More recent evidence from the USA, based on reviews of clinical trials, warns of the risk untreated hypertension has on increasing cardiovascular events (Psaty, Weiss et al. 2006).

Adherence to medication also affects the efficiency of hypertension treatment. A study examining the cost-effectiveness of arterial hypertension treatment by age, sex, arterial hypertension stage, type of drug used and level of treatment compliance concluded that improvement of treatment compliance yields the greatest gain both in the effectiveness and efficiency of the treatment (Mar and Rodríguez-Artalejo 2001).

Determinants of non-adherence in hypertension

The main determinants of non-adherence in chronic conditions, discussed in the review of the literature in part 2.4.2 of the thesis, i.e. socio-economic and demographic factors, condition related factors, regimen related factors, patients' beliefs and doctor-patient communication, have also been found to be associated with non-adherence in antihypertensive medication.

More specifically, the asymptomatic nature of the disease is an important characteristic of hypertension that has been argued to be a significant factor contributing to poor adherence (WHO 2003). Symptoms, such as pain, often work as warning signs for patients, forcing them to take their medication, yet this is not the case in hypertension.

Regimen related factors have also been reported as determinants of non-adherence due to the complexity of drugs for hypertension. A study among hypertensive patients in a Medicare population in the USA showed that patients adhere better to

simple treatment regimens than complex ones (Fung, Huang et al. 2007). Another study in the UK showed that patients have reservations about antihypertensive drugs including preference for an alternative to drugs, doubts about their necessity and possible long-term or hidden risks (Benson and Britten 2003). All these reservations were shown to be associated with non-adherence to medication.

In terms of demographic and socio-economic factors evidence is less clear as it is for the majority of the conditions explored in the literature review of this thesis.

Evidence has clearly shown that the actual communication between the doctor and the patient and the way this is perceived by the patient has an impact on the latter's decision to adhere to antihypertensive medication in a study in the USA (Clark 1991). Positive experience with doctors, including advice given and issues of trust were identified as reasons for patients to take antihypertensive drugs in a study by Benson and Britten in the UK (2002).

Research questions

This is, to our knowledge, one of the first attempts to examine the problem of non-adherence within a specific group of patients in Greece, a country where no previous systematic empirical evidence exists.

The hypothesis addressed here is:

H2: The patient perceptions of the doctor's role, above all else, have an impact on their decision to adhere to medication.

The specific research questions that will be used to examine this hypothesis are:

- **Q4:** What do Greek patients with hypertension think of their doctors and how does this affect their attitudes towards medicines?
- **Q5:** Which information channels do patients use and how do these channels influence patients' behaviour towards medicines? What is the importance of doctors in supplying information?
- **Q6:** What other factors may affect non-adherence? Is it beliefs towards the disease and the treatment or the disease and treatment characteristics themselves that influence non-adherence?

To address the above questions, a questionnaire survey among patients in Greece was designed, supervised and analysed. The survey took place in the Centre for the Treatment of Hypertension in the Hippocration General Hospital of Athens.

The rest of this chapter is organised in the following way. First, the methodology of the survey is described in detail in Section 5.2, explaining the sampling procedures, interview techniques, the design of the questionnaire as well as its evaluation. Then, the results of the analysis are presented in Section 5.3, starting with an evaluation of the scale used and the response rates, followed by a description of the variables. The chapter then presents the determinants of non-adherence among the group of hypertensive patients in Greece. Section 5.4 discusses the limitations of the study, while Section 5.5 is a general discussion of the findings with respect to the research questions. Some policy recommendations are also suggested here. Finally, Section 5.6 concludes.

5.2 Methodology

This section presents the methodology of the study, explaining the rationale for the choice of the sample under study, the research design and the development of the questionnaire used to address the research questions.

5.2.1 Sampling Procedures

It is considered essential to discuss the general methodological difficulties of research in Greece, before explaining the specific methods used for the present study. The lack of organised data is one of the main drawbacks in conducting research in Greece and makes secondary analysis a difficult task.

However, primary data collection is not easy either. As mentioned in the brief description of the Greek health system above (see Section 2.5) there is a lack of organised primary health care and a plethora of specialised doctors. Greeks are not enrolled in lists, there is no system of referral and no integration between primary and secondary care in the Greek health system. This is reflected in the way patients choose who to visit for diagnosis and treatment. For example, an individual with

hypertension can consult a family doctor, a cardiologist, a hospital doctor (public or private) but can also visit a centre that specialises in the treatment of the condition.

Hence, getting a representative sample of patients with hypertension in Greece is not possible from existing overall lists. It was therefore decided that a more appropriate way of defining a homogeneous sample would be to conduct the study in a centre that specialises in the treatment of hypertension. Despite its limitations, choosing the sample from a specialised centre has its own advantages. It made the data collection more convenient and results can be interpreted within a specific context and setting.

The survey took place in the Centre for the Treatment of Hypertension in Hippocration General Hospital of Athens. The Centre remains one of the country's biggest and most well known centres for the prevention and treatment of hypertension. More than 3,500 patients visit the centre regularly. The beginning of the contacts with the doctors coincided with the end of a clearing up period of the data, which was conducted by the Centre in order to make sure that all the patients on the list were regularly visiting the Centre, had not changed doctor and had not passed away. The contact details of all the patients on the list were also checked. This resulted in an up-to-date database, turning it into an even more valuable source of information.

Given the availability of the patients' contact details it was decided that the interviews could be conducted by phone. For that purpose the survey company RASS, based in Piraeus, was recruited to conduct the telephone interviews. The company would contact all persons on the list.

5.2.2 Sample size

Seven hundred and forty-three individuals finally completed the interview. The sample size is sufficiently high for our investigation, having a power of 95% at the 0.05 significance level and a sampling error of less than 3.5%.

5.2.3 Interviewing Techniques

The choice of telephone interviewing technique was primarily opted for as the most efficient, given that the Centre for the Treatment of Hypertension in Hippocration keeps records of the patients' phone numbers. However, telephone interviews have more benefits, as well as weaknesses that are discussed below.

Strengths of telephone interviews

Generally, phone surveys get quite high response rates and interviews can be taken quickly and with little expense (Weisberg and Bowen 1977).

In the context of the specific study, there are more benefits. The selection of patients from the medical records makes possible the generalization for *patients* not *episodes*, as would have been the case if the survey were conducted in the outpatient clinic while the patients are waiting to see the doctor.

The telephone survey also solves an important methodological issue regarding the estimation of adherence rates. The desire to please the health care provider or researcher may encourage patients to exaggerate reports of medication adherence. The setting where assessment occurs as well as the relationship to the interviewer may also influence the extent that this social desirability effect occurs (Stone, Turkkan et al. 2000). In the case of the telephone interviews patients are less likely to associate the survey with their treatment and their doctor and therefore it is less probable that they report biased adherence rates in order to please their physician.

Evidence also shows that patients tend to adhere better the closer they are to visiting their doctors and therefore surveys conducted in a clinic setting just before or after a consultation report higher adherence rates (Dunbar-Jacob and Schlenk 2001). This obstacle can also be overcome with the telephone interview when patients are interviewed at a random moment of their everyday life.

Finally, in the busy context of a hospital setting patients are probably willing to dedicate less time to completing a questionnaire. A contact by telephone gives the

patient the chance to choose a different and more convenient time or day for the interview to take place and this reduces the non-response rate.

Weaknesses of telephone interviews

Telephone interviews are not without problems. The style of the interviewers is quite important as it may lead to biased answers. Therefore, the design of the survey must be done in such a way that the interviewers' different styles do not influence the patients' responses. The present study, however, was conducted by interviewers who were experienced in telephone surveys; they were trained prior to the commencement of the survey, and were supervised throughout the interviews.

Instructions to interviewers

The interviewers were given specific instructions on how to introduce themselves to the interviewees. They began by informing the interviewee they were calling from the opinion research company RASS, which was conducting a survey on hypertension for academic purposes. The interviewers explained that the aim of the survey was to examine people's views and opinions regarding hypertension. Emphasis was put on reassuring the interviewees that all answers would be treated anonymously and that their doctors would not have access to the data. They then kindly asked the person whether s/he would like to participate in the survey.

The interviewers did not refer to the Hippocration Hospital in an effort to avoid association of the survey with their doctors and treatment, which may bias respondents' answers. However, they were instructed to give this information if the individuals asked for it.

5.2.4 Questionnaire Design

This stage includes the process of translating the broad objectives of the survey into questions that can obtain the required information. The questionnaire was designed to cover all fundamental aspects of our inquiry. It satisfies all tested criteria for a

well designed set of questions that will allow a thorough investigation of the issues that concern us.

The main purpose of the thesis is to investigate how the perceptions patients have about the doctor-patient relationship affect their decision to adhere. However, this cannot be isolated from other influences which also need to be examined. These include demographic and socioeconomic characteristics, clinical factors, beliefs regarding medication and the condition. We are also interested in examining the information sources patients use and their impact on adherence.

The order of the questioning was also considered crucial to avoid a number of potential biases. However, it is not indicative of the importance we give to each section. For example, the adherence measurement items were left towards the end of the questionnaire so that patients would not think of the survey as one that was investigating their behaviours but as one that was looking for their views. To avoid another bias, that of association of the survey with the physicians, patients were not asked to give their opinion on doctors at the beginning of the survey, but rather in the middle of the interview. Finally, the risk questions were asked after the measurement of non-adherence to avoid bias caused by the fact that when people are aware of the implications of untreated hypertension they tend to report better adherence rates. Socio-demographic characteristics were left to the end of the interview.

Following the above, the order of the questions followed was:

- Clinical characteristics (Q1.01-Q1.03).
- Information about medication and hypertension (Q2.01-Q2.04).
- Perceptions about the specific drugs used (Q3.01a-Q3.05b).
- Relationship with the doctor (Q4.01-Q4.17).
- Measurement of adherence (Q5.01-Q5.04).
- Perception of risk (Q6.01-Q6.02).
- Socio-demographic characteristics (Q7.01-Q7.06).

Apart from the information collected with the questionnaire, additional information was taken from the medical records of the Centre for Hypertension, mainly regarding medical characteristics of the patients. This information was taken into

consideration for the development of the questionnaire and data that could be extracted from the medical records was not repeated in the interview unless necessary. For this reason, in the following description of the questions it is considered essential to explain what kind of information was gathered from the medical records and what was left to be collected from the questionnaire.

Clinical factors

This section examines whether clinical characteristics of the individual are associated with non-adherence to medication. Information taken from the **medical records** includes:

- Information on hypertension. Information includes time since the patient has been diagnosed with hypertension. The variable is continuous and measured in years.
- Clinical records on other conditions. Information was given on whether the patient suffers from other illnesses including dislepidemia, coronary heart disease, diabetes and whether they have suffered a stroke or heart failure. All the variables are binary (0=no, 1=yes).

The **questionnaire,** given in Appendix B, asks the individuals to self-report their health status, using two items taken from the European Social Survey (Q1.01-Q1.02); subjective general health and disability. The question on health status asks individuals whether they would say their health in general is very good, good, fair, bad or very bad. The answers were merged into three: good, fair and bad.

The question on disability asks respondents if they are hampered in their daily activities in any way by any longstanding illness, or disability, infirmity or mental health problem and if yes, to what extent. Answers include: no, yes and yes to some extent and were merged into: yes (including 'yes, to some extent') and no.

A question on smoking habits is taken from the European Community Household Panel Survey (Q1.03). Individuals are asked whether they smoke or if they ever did. Answers include: smoke daily, smoke occasionally, do not smoke, used to smoke daily and never smoked. Answers are merged into three groups: never smoked,

smoke (daily or occasionally) and do not smoke (used to smoke daily or occasionally).

Information

Literature on the topic of non-adherence aims to explore people's knowledge on illnesses and medication but it pays little attention to the information channels which affect patients' decisions. This study focuses on the information patients get both regarding their condition (Q2.01) and their medication (Q2.02). Eight different options are given: Family/friends, doctor, pharmacist, nurse, other patient with hypertension, the Media (TV, Radio, and Newspaper), Internet and Magazines on health issues and nutrition. The questions are open-ended and the patient could report any other sources of information they use.

Finally, individuals are asked to comment on how well informed they consider themselves regarding hypertension (Q2.04) and the medication they are using to treat it (Q2.05).

Beliefs and Personal experience

A number of beliefs about medication have been identified in the literature as common among patients with chronic illnesses (Horne and Weinman 1999). Some research supports the idea that patients' beliefs may derive from considerations unrelated to the drug's pharmacology (Benson and Britten 2002). Therefore, it is of interest to explore whether it is the beliefs about medication rather than the actual experience with them that affect patients' decision to take medication or not. To explore this issue the following method is used.

A number of factors that have been shown to be associated with use of medication are identified: efficacy of medication, control, side effects (Berman, Epstein et al. 1997; Newton, LaCroix et al. 1997; Grant, Devita et al. 2003) and dependence and addiction (Boulet 1998). Patients are first asked to express what they *believe* about medication (e.g. "Medication for blood pressure has many side effects for those who use it") and then whether they have *personally experienced* it (e.g. "I have

personally experienced side effects due to the use of the prescribed medication for blood pressure").

Questions Q3.01a-Q3.05a on beliefs ask patients to indicate how strongly they agree or disagree with the following statements:

- High blood pressure can be treated without medication.
- People who use medication regulate their blood pressure.
- Medication for blood pressure has many side effects for those who use it.
- People who take blood pressure medication become addicted to it due to its long-term use.
- People with high blood pressure are dependent on their medication for life.

Answers to each of the above questions are scaled on a 5-point scale ranging from "strongly agree" to "strongly disagree" and were merged into two groups (agree, disagree) for the purpose of the analysis.

The second cluster referring to personal experience Q3.01b-Q3.05b asks patients to indicate whether the following statements apply to them:

- In the past, I have been successful in treating my blood pressure without the use of medication.
- I have regulated my blood pressure thanks to the medication I have been taking.
- I have personally experienced side effects due to the use of the prescribed medication.
- I feel I have become addicted to my medication for blood pressure as a result of long-term use.
- I will always be dependent on my medication for blood pressure.

Answers to each of the above questions are binary (0=no, this does not apply to me, 1=yes, this applies to me).

Doctor-patient relationship

This section of the questionnaire focuses on the main purpose of this chapter, which is how patients view the doctor-patient relationship. This remains a topic of great

interest in the literature of non-adherence and has been shown to be associated with patients' decision on whether to take medication (Britten and Ukoumunne 1997; Britten, Stevenson et al. 2000; Jenkins, Britten et al. 2003). The present study examines patients' views of the doctor and two groups of questions were used for this purpose. The first group (Q4.01-Q4.10) is adopted from the ESS and aimed at getting an understanding of the way patients think about doctors in general, looking at issues of trust, communication and reliability.

Questions ask individuals to show their agreement with the following statements:

- Most illnesses cure themselves without having to visit a doctor.
- People rely too much on their doctors rather than themselves to keep healthy.
- When people are sure about what medicine they need, their doctor should just prescribe it for them.
- It's best to follow doctors' orders.
- I generally feel a bit disappointed when I leave a doctor's surgery without a prescription.

Answers to each statement above include: agree strongly, agree, neither agree nor disagree, disagree and disagree strongly, and for the analysis are merged into two categories: agree (including those who agree or agree strongly) and not agree (including those who disagree, disagree strongly and neither agree nor disagree).

Another group of questions asks respondents to indicate how often they think the following applies to doctors in general.

- Doctors keep the whole truth from their patients.
- Before doctors decide on a treatment, they discuss it with their patient.
- Patients are reluctant to ask their doctors all they would like to ask.
- Doctors are willing to admit their mistakes to their patients.
- Doctors use words or phrases that their patients find difficult to understand.

Responses to each statement above include: never or almost never, some of the time, half of the time, most of the time, always or almost always. Answers to the above question are merged into two categories: yes, the statement applies to doctors (including never or almost never and some of the time) and no, it does not (including all the other categories).

A factor analysis was conducted to identify whether it is possible to reduce the number of the above variables on doctor-patient relationship. The analysis did not confirm this was possible (see Appendix B1.1-B1.2) and therefore, all variables were included in the regression model.

The theoretical elements behind the questions are not always stated clearly in the ESS. However, it seems that the questions are mainly testing elements of trust ("doctors keep the whole truth"), paternalism and shared-decision making ("before doctors decide on a treatment, they discuss"). The last two questions look at doctors' sincerity and their ability to communicate effectively using simple words and phrases.

The purpose for adoption of questions from the ESS is twofold. First, it serves to examine whether beliefs about doctors affect patients' decision to follow recommendations. But also it allows for a comparative discussion to be done first within the country context and then on the specific patient group. Although the ESS and the study on hypertensive patients are two different surveys in terms of population under study, methods and context, it is interesting to identify similarities and/or differences between the views of the general population and those of the specific group of Greek patients regarding the same issues. Some of these comparisons are discussed at the end of this part, while most in depth comparisons are left for the final discussion chapter of the thesis.

The second group of questions (Q4.11-Q4.17) explores the patient's feelings regarding the last consultation and her/his satisfaction with it. The literature has identified a number of problematic aspects of the consultation that may be associated with non-adherence to medication, such as issues of time (Brown 2004), discussion about medication and illness (Lin, Von Korff et al. 1995), explanation on medication and illness (Bond and Bywaters 1999) and overall satisfaction with the consultation (Bultman and Svarstad 2000). The questions ask patients whether the following statements apply to them:

- The doctor did not have much time for me.
- I discussed everything regarding my condition with the doctor.
- I discussed everything regarding the prescribed medication with the doctor.

- The doctor explained to me everything I needed to know about blood pressure.
- The doctor explained to me everything I needed to know about the prescribed medication.
- The doctor explained the medication's side effects and how to deal with them.
- I was generally satisfied with the outcome of the visit.

Some respondents (known as "yea sayers") tend to agree with statements rather than disagree. For this reason it is suggested that the items should not be presented in a way that strongly agree always links to the same broad attitude (Boynton and Greenhalgh 2004). Following this suggestion, in an attempt to reduce bias from the "yea sayers", some questions are presented in a positive way, i.e. "I was overall satisfied with the outcome of the consultation", while others are phrased in a negative, such as "The doctor did not have much time to dedicate to me".

Measurement of non-adherence (Q5.01-Q5.04)

As discussed in the literature review chapter there are various adherence measurement procedures, but no "gold-standard". Two main factors were considered at this point: a) the nature of the present study, i.e. telephone interviews and b) the lack of other available methods for measuring non-adherence, such as electronic monitoring, prescription refills and biological indicators (see Chapter 2.4.1 for more details on the measurement of non-adherence). Therefore, the self-report method was chosen as the most appropriate measurement procedure for non-adherence.

Questioning of patients is widely used as a method of measuring adherence, but the selection of the questions varies from study to study, depending on the illness, medication and the setting of the study (Vitolins, Rand et al. 2000). Regardless of the scale chosen, the questions should be asked in an indirect and, most importantly, in a non-judgemental way. No self-report method approaches perfection so, as a result, the selection of questions was based on a careful review of the literature and the items chosen have been tested in previous studies for their validity and reliability and are simple and comprehensible.

The Morisky scale (1986) was chosen as the most appropriate way of measuring non-adherence in our study. The scale is composed of 4 yes/no questions regarding

use of medication and it is therefore a simple and quick adherence screening tool. The questions ask individuals a) whether they ever forget to take their medicine, b) if they are careless at times about taking medicine, c) whether, when they feel better they sometimes forget to take their medicine and d) if sometimes, when they feel worse when they take medicine, they stop taking it. The Morisky score is calculated by assigning one point for each positive answer, thus it ranges between 0 and 4. The scale has been widely used in previous empirical studies to measure medication adherence both in hypertension and other chronic illnesses (Gascon et al, Fairley et al, Afonso et al, George et al, Krapek et al, Roth et al.).

Morisky et al. (1986) in their paper defined a score of 3 or 4 as "low on the medication behaviour scale", indicating therefore high likelihood of non-adherence. A similar cutting off point of the scale has been used in a number of studies. However, other researchers have been more strict and define as adherent patients only those who have answered 'no' to all four questions (Gascon, Sanchez-Ortuno et al. 2004; Roth and Ivey 2005; George, Munro et al. 2006).

On the other hand, Shalansky et al. (2004), however, suggest that the threshold score may differ from study to study, depending on the rate of non-adherence. When non-adherence rates are low it may make sense to use a Morisky score threshold of ≥ 2. In that case, and given that it is difficult to follow patients with other methods, such as prescription refills, it might be acceptable to 'miss' a proportion of non-adherent patients (i.e. low sensitivity) in an effort to quickly identify some patients who would most likely be non-adherent. However, in a cohort where adherence is low, results from the Erickson et al study (2001) suggest that the Morisky score of ≥ 1 may be a valuable tool for identifying non-adherent patients. It was therefore decided that the threshold score should be defined after the completion of the data collection. This is discussed in Section 5.3.3 below, where a simple description of the Morisky score indicates the threshold to be used.

The use of the Morisky scale has been criticised for low internal consistency as this is measured by Cronbach's alpha (Shalansky, Levy et al. 2004). However, Cronbach's alpha is a coefficient which depends on the number of items on the scale (Bland and Altman 1997). This means that the more questions used to measure a

behaviour the higher the coefficient. However, increasing the number of questions makes the questionnaire more complicated to answer and requires more time to be completed. For this thesis two main factors were considered at this point: the nature of the disease under study and the use of telephone interviews for the data collection. Given that hypertensive patients are usually older people and that interviews should be as short as possible it was suggested that keeping the scale simple should be the main criterion for selection.

Additionally, particular attention is paid in order to avoid obstacles that may affect the accuracy of the method. Some of these obstacles are discussed here. The interviewer's skill has been claimed to be a factor that affects the accuracy and validity of self-reporting methods (Farmer 1999). The present study aims to overcome this barrier given that independent interviewers, who were not related to the development of the questionnaire and therefore cannot lead the discussion, conducted the interviews. The wording of questions about patients' behaviour can also affect their responses; negative questions that seem to blame the patient will give biased answers (Ross 1991). To avoid bias an introductory phrase was used before the Morisky scale presenting non-adherence not as a behaviour that is socially undesirable but, on the contrary, as something other people may do.

However, despite its various limitations, it has been suggested that the Morisky scale is useful in specific situations. Shalansky et al. (2004), after pointing out the limitations of the scale, conclude that the use of the Morisky scale is reasonable in some settings, that is, in studies where "there are too many patients to follow in detail with the available pharmacy records" (Shalansky, Levy et al. 2004).

The Morisky scale has been developed in the English language and has been tested for psychometric properties and concurrent and predictive validity (Morisky, Green et al. 1986). However, the scale also needs to be psychometrically validated in the Greek survey by testing its reliability and validity.

Reliability concerns the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials (Carmines and Zeller 1979) and it is examined in this study both in terms of internal consistency and test-retest reliability. Internal reliability implies that the different items of the index measure

different aspects of the same attribute. It is tested through a number of coefficients including Cronbach's Alpha and inter-item correlation coefficient for the different scale items. The reliability of the scale in the original Morisky et al. (1986) study was "reflected in its relatively high (Cronbach's Alpha=0.61) measure of internal consistency". The same index, Cronbach's Alpha, is used to calculate the internal reliability of the scale in the present study.

Test-retest reliability measures the degree of agreement between two measurements taken at two different points in time. To calculate the adequate statistic, i.e. kappa coefficient, a sub-sample of the participants (approximately 15%) was contacted randomly and asked whether they would like to participate again in the survey. They were reassured that this time the interview would be much shorter consisting of only 4 questions. This retest interview was conducted 3 weeks after the original one.

The concept of validity refers to the best available approximation to the truth of a given inference, proposition or conclusion (Cook and Campbell 1979). Its estimation is less straightforward than the estimation of reliability. Face and content validity assessment was carried out in discussion with experts and in a pilot study. This included both academics working on the field but also the doctors working in the Centre.

Ideally, criterion validity should compare the self-reported measure with a "gold-standard" measure. However, as has been mentioned in previous chapter, there is no "gold standard" in the measurement of non-adherence and therefore construct validity is used as a validation process. In the original study by Morisky the scale demonstrated *concurrent validity* with blood pressure control at baseline but also with blood pressure control 6 and 42 months afterwards (Morisky, Green et al. 1986).

Risk factors

The aim of this group of questions is twofold. First, it aims at exploring the patients' knowledge of hypertension as a factor that increases risk for developing other diseases. It also explores patients' knowledge of the importance of systolic and diastolic blood pressure. It then looks at the extent to which this knowledge may be

influenced by the different information channels. The second aim is to explore whether patients who are aware of the risk implication of hypertension are adhering more to the prescribed medication.

Patients were asked (Q6.01) whether they agree with the statement that untreated hypertension can lead to a) stroke, b) heart attack, c) heart failure, and d) kidney failure. Evidence shows that patients are highly aware that hypertension increases the risk of developing stroke and heart attack, but they are less aware of that it increases the risk of heart failure and kidney disease (Alexander, Gordon et al. 2003).

Patients are also asked to report (Q6.02) which of the two types of hypertension, systolic or diastolic, is more important for the development of other diseases. Evidence suggests that the systolic blood pressure is a more important risk factor for the development of other diseases (Basile 2002) and guidelines in the USA highlight its importance (Izzo, Levy et al. 2000).

Socio-economic and demographic characteristics

This section aims at forming a general idea of the patient's profile and to examine whether demographic factors influence non-adherence. The literature review conducted in the previous chapter showed that evidence on the impact of socio-demographic factors on non-adherence is controversial and varies from study to study (see Section 2.4.2 for more details).

For the present study the following characteristics of the patients are collected with the questionnaire:

- Year of birth. The age is then calculated using 2006 as the base year. Age is used as a continuous variable (i.e. measured in years) for the analysis. However, as was shown in Section 2.2.2, the impact of age is complex with some studies showing positive association with non-adherence while others negative. One hypothesis is that the effect of age on non-adherence may be negative up to a point, while after this point the effect is positive due to memory loss or other behavioural effects. This hypothesis was tested in

Chapter 4, but failed to be confirmed. It is again examined in this chapter, by taking into account a quadratic specification of age.

- Education. We chose the scale suggested by RASS, the company that conducted the survey, because it is simple and it avoids possible misunderstandings due to the changes in the Greek educational system some decades ago. For the purpose of the analysis, the scale is rescheduled in the following way:
    - Primary education (including answer a of the questionnaire).
    - Secondary education (including answers b-d of the questionnaire).
    - Tertiary education (including answers e-g).
- Income. Income question is adopted from the ESS (Q1.04) and it is used as a proxy of income as it is based on what the individual believes about the household's income.
- Marital status, as used by RASS in similar Greek surveys. The question is rescaled into a binary variable (0= not married, 1=married).
- Living alone (1) or not (0).
- Having children (1) or nor (0).

5.2.5 Cross-cultural adaptation

In order to be used in a Greek survey, the questionnaire needs to undergo cross-cultural adaptation procedures and linguistic validation. The methodology used in order to obtain semantic, idiomatic, experiential and conceptual equivalence in translation of the questionnaire was mainly based on the recommendations and guidelines of Acquardo and colleagues (2004) and Guillemin, Bombardier et al. (1993). It includes the following steps:

Step 1: Review and conceptual definition

The first stage aims at clarifying the concepts investigated by each item of the original instrument and to make sure they are reflected appropriately in the target language.

Step 2: Forward translation

The questionnaire was independently translated into Greek by the present author and another native speaker, who lived in Greece and was fluent in English. The second

translator had been briefed thoroughly about the purpose of the study. Both translators produced a forward translation of the original English questionnaire into Greek without consulting each other. Then, the two translators met and agreed after discussions on the parts that were of ambiguous interpretations.

There was only one exception in the above translation process. The items adapted by the ESS were already translated into Greek for the purpose of the survey and therefore it was decided that this Greek version would be used for collection of data in the present study.

Step 3: Backward translation

A third translator was then recruited to backward translate the Greek questionnaire into English. The translator's first language was English, she was fluent in Greek and lived in Greece. The translator worked independently. The present author then reviewed the backward translation and, in collaboration with the translator, discussed possible discrepancies.

Step 4: Pilot testing and approval of the target version

This stage included two procedures, clinicians' and academics' review and cognitive debriefing. Clinician's review aims at getting input from medical experts as to the domain-specific terminology. In particular the Director of the Centre suggested that the term 'high blood pressure' should be used instead of 'hypertension' as this is the term mainly used by doctors during consultation.[1] The questionnaire was also reviewed by Professor Nicky Britten, an expert on the topic of the doctor-patient relationship, who gave useful feedback.[2] More specifically, she offered helpful suggestions on distinguishing between 'addiction' and 'dependence'. Finally, Dr George Tsakos also provided valuable comments on issues of the reliability and validity of the questionnaire.[3]

The cognitive debriefing included interviews with patients to test the clarity and appropriateness of the questionnaire. It is essential to check that the questionnaire works in the study group and identify administrative and analytical problems (Boynton 2004). During the pilot phase, the researcher took notes on how long

[1] From personal contact with Dr. Konstantinos Tsioufis, Head of the Centre for Hypertension at Hippocration Hospital in Athens, 20th January 2006.
[2] Personal contact with Professor Nicky Britten, 15th February 2006.
[3] Personal contact with Dr George Tsakos, 16th March 2006.

people take to complete it, whether any questions need to be repeated or explained and whether the respondents show confusion or surprise at a particular question.

Twenty patients participated in the pilot phase. Their answers are not included in the final analysis as the questionnaire changed after the pilot survey.

Step 5: Proofreading

To avoid typing and grammatical mistakes the questionnaire was proofread at this stage, leading to the final version.

5.2.6 Fieldwork period and ethical approval

The interviews were conducted between the 11th and 12th of April 2006. The study was approved by Hippocratio's Hospital Research Ethics Board on the 30th of March 2006 (protocol number 7173).

5.2.7 Statistical specifications

The nature of the dependent variable determined the type of the statistical analysis used. Given that the Morisky scale measuring non-adherence to medication was merged into a dichotomous variable a probit model was used to identify determinants of patients' decision.

The age and sex composition of the sample was different from the composition of the population, i.e. the sample had more women than men and age was above the average. Thus, at the beginning of the analysis we weighted the sample using post-stratification weights for age and sex, on the basis of the overall list of the Centre.

Stata edition 9.2 was the statistical package used for the analysis.

5.3 Results

This section presents the main results of the analysis of the Greek survey. It starts with a discussion on the statistical and psychometric characteristics of the study. It continues with a general description of the sample and presents the patients' clinical characteristics as well as responses on information channels. The next section

presents the factors associated with non-adherence to prescribed medication among Greeks.

5.3.1 Response Rate

The opinion research company RASS contacted all members of the list of individuals enrolled in the Clinic for the Treatment of Hypertension in Hippocration General Hospital. There were up to four attempts to contact each person in the list, while an appointment was arranged with those who were willing to participate but for whom the time of the first contact was not convenient.

Seven hundred and forty-three individuals completed the interview, 318 refused to participate, 337 were not eligible and the rest did not pick up the phone after the fourth effort to contact them. We report here the Response Rate RR5 defined by the American Association for Public Opinion Research (AAPOR) as the number of completed interviews divided by the number of completed and refused ones (AAPOR 2006). The response rate is 68.8% and is considered sufficiently high for our investigation.

5.3.2 Reliability

The reliability of the Morisky scale is measured in the present study both in terms of internal consistency and test-retest reliability. Internal reliability is tested here through the Cronbach's Alpha and inter-item correlation coefficient for the different scale items.

Table 5.1: Internal reliability – Cronbach's alpha

Item	Sign	Item-test correlation	Item-rest correlation	Average inter-item covariance	Alpha
Forget	+	0.7024	0.3687	0.0352	0.4559
Careless	+	0.757	0.469	0.0259	0.3586
stop when better	+	0.5808	0.3061	0.0491	0.5096
stop when worse	+	0.5629	0.2252	0.0540	0.5697
Test scale				0.0411	0.5539

The reliability of the scale is lower than the original Morisky study, where Cronbach's Alpha was 0.61 (Morisky, Green et al. 1986), yet not much lower. Also, the "careless" item has a lower alpha than the previous "forget" item.

Test-retest reliability measures the degree of agreement between two measurements taken at two different points in time. This retest interview was conducted 3 weeks after the original interview and the kappa coefficient was calculated. Kappa was 0.71, indicating a good strength of agreement (Altman 1991).

5.3.3 Descriptive analysis

Demographic and socio-economic characteristics of the sample

The average age of the sample was 61 years and 41% of the respondents were men. The majority of the respondents was married (81%), had children (88%) and did not live alone (76%). Almost half of the respondents felt they could cope with the present household income. A proportion of 25% stated they live comfortably while another 25% felt it was difficult or very difficult for them to cope on present household income.

Table 5.2: Description of variables

Demographic and socioeconomic factors		**Mean**	**Stand. Error**
age	(years)	61.5835	0.4446
sex	(0=female 1=male)	0.4170	0.0191
married	(0=not married 1=married)	0.8161	0.0149
education	(0=primary education)	0.2571	0.0169
	secondary	0.4185	0.0191
	tertiary	0.3244	0.0181
feeling about household's income			
	(0=living comfortably)	0.2481	0.0167
	coping on present income	0.4649	0.0193
	difficult on present income	0.1928	0.0153
	very difficult on present income	0.0942	0.0113
children	(0=no 1=yes)	0.8894	0.0121
alone	(0=living with others 1=living alone)	0.2436	0.0166

A proportion of 22% of the respondents had received primary education. The majority of the participants (42%) had finished secondary education (including those having finished Junior High School, High School or Technical School), while 28% held a University degree.

Clinical characteristics

On average, the patients had been diagnosed with hypertension for 7.8 years and were on medication for 5.2 years. About 39% of the respondents had been diagnosed with dyslipidemia, 5% had a coronary heart disease, 17% had diabetes and 4% had suffered a stroke.

The majority of the respondents (57%) rated their general health status as very good, or good. One third of the participants considered their health fair and only 8% said it was bad or very bad. Also, one out of three respondents felt hampered in their daily life in some way by a long-standing illness, or disability, infirmity or mental health problem.

A relatively high percentage of the respondents (24%) reported they smoke on a daily basis or occasionally, while almost 31% said they had quitted smoking and 45% reported they had never smoked.

Doctor-patient relationship

Beliefs on illnesses and the doctor-patient relationship were explored through a number of questions.

The first group of questions asked respondents to indicate how much they agree or disagree with a number of statements regarding illnesses, medicines and doctors. Table 5.4 indicates that the biggest proportion of the respondents seem to disagree with the statement that most illnesses like common cold can be cured without visiting a doctor. Only 14% of the respondents held this opinion while 76% did not. On the other hand, a large proportion of respondents (68%) believe that people rely too much on doctors in order to keep healthy. About half of the patients (45%) believe that when people are sure of the medicine they need doctors should just

prescribe it, but only 12% feel disappointed when leaving the doctor's surgery without a prescription. Finally, the vast majority supports the statement that people must follow doctors' advice (98%).

Table 5.3: Beliefs about illnesses, medicines and doctors

Agree or strongly agree that…	
…most illnesses cure themselves without going to doctor	14%
…people rely too much on doctor	68%
...when people are sure, doctor should prescribe	45%
…it's best to follow a doctor's advice	98%
…feel disappointed when leaving doctor without a prescription	12%

The second cluster of questions was used to assess respondents' beliefs about doctors in general. Table 5.5 demonstrates that about one out of five respondents believes that the doctor keeps the whole truth from their patients. Also, 58% think that before patients decide on a treatment, they discuss it with their patient. A similar tendency is shown when almost 30% of the patients are reluctant to ask their doctors all the issues they would like to ask. Finally, only 12% think that doctors are willing to admit their mistakes to their patients and about 34% that they use words or phases that their patients find difficult to understand.

Table 5.4: Beliefs about doctors

Believe that always or most of the times…	
…doctors keep the whole truth from patients	24%
…doctors discuss treatment before they decide	58%
…patients are reluctant to ask doctors questions	29%
…doctors are willing to admit mistakes	12%
…doctors use words patients find difficult to understand	34%

Last consultation

Figure 5.2 presents respondents' statements regarding the last time they consulted their doctor specifically for hypertension. Overall, the vast majority (92%) showed

general satisfaction with the consultation. They felt they had the opportunity to discuss with their doctor all they wanted to know regarding hypertension (85%), and generally they believed their doctor explained to them everything about their condition (83%). However, when asked similar questions about medication their responses were less positive. Fewer respondents felt they discussed with their doctor everything about the medication, (75% for medication compared to 84% for hypertension). What is more, an even lower percentage felt that the doctor explained enough about medication (69%) and even less satisfied with the explanation the doctor gave on side effects (32%). Finally, what seemed the biggest drawback of the consultation was the time the doctor spent with them, where only 28% felt that the doctor had spent enough time.

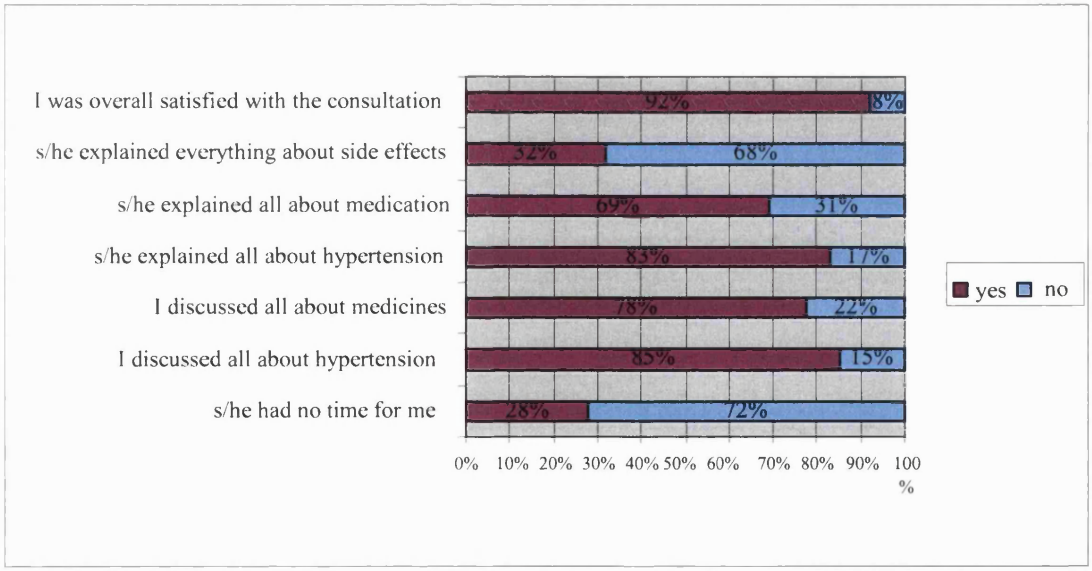


Figure 5.2: Last time I visited my doctor...

Information Channels

Participants were asked to indicate the sources they use to get information on hypertension and medication for hypertension (Table 5.5). The doctor was the dominant source of information both for hypertension and the medication taken to treat it. All other sources were mentioned very rarely. An interesting finding is that the Media and magazines on health issues and nutrition were the second most commonly reported source of information for hypertension, more than the family and the pharmacist. Finally, the Internet was stated as an information channel only

by less than 3% regarding hypertension and by only 1.5% regarding medication. Overall, sources of information regarding medication were very limited in relation to the ones for hypertension.

Table 5.5: Use of the following sources to get information regarding…

	…hypertension	…medication
Family/friends	4.3%	0.5%
Doctor	97.3%	97.9%
Pharmacist	6.3%	5.4%
Nurse	1.1%	0.3%
Other patients with hypertension	2.4%	0.3%
Media (TV, Newspaper, Radio)	10.8%	1.7%
Internet	2.8%	1.5%
Magazine on health issues and nutrition	13.9%	2.5%
Other sources	1.8%	0.4%

Beliefs and personal experiences

Respondents were asked to comment on a number of statements regarding medication, first by reporting what they generally believe about it and then whether they have personally experienced it (Figure 5.3). A t-test was used to examine differences in means between what patients believe and what they actually experienced.

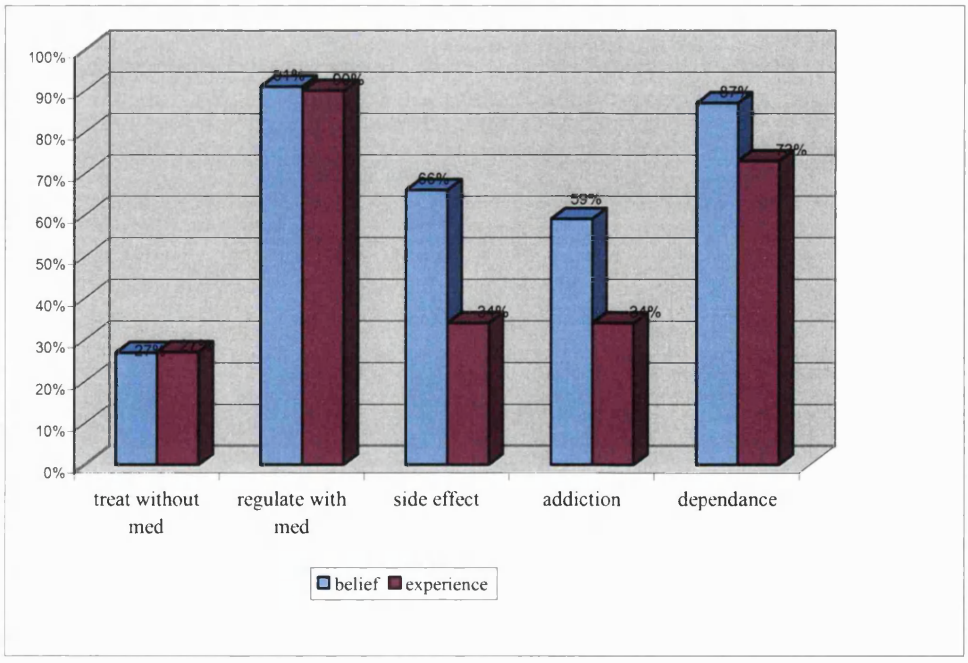


Figure 5.3: Beliefs and personal experience regarding medication.

- **Treatment of high blood pressure without medication**

The majority of the respondents disagreed with the statement that hypertension can be treated without medication, with approximately 27% believing that this is true. Similar responses were given when individuals were asked to report whether they had personally tried to treat their condition in the past without using medication; again 26% responded they have. The difference between the two means is not statistically significant (t=-0.3376 and p=0.6321).

- **Use of medication and control of blood pressure.**

As in the previous statement, the vast majority of the respondents (91%) believe that people who take antihypertensive medication regulate their hypertension and similarly 90% state they feel they have regulated their blood pressure thanks to the medication. The difference between beliefs and experience of regulating hypertension is not statistically significant (t=0.5297 and p=0.2982).

- **Medication for high-blood pressure and side effects**

Answers regarding the use of medication and side effects were significantly different (t=13.6013 and p<0.001) when patients were asked for their beliefs and personal experience. Almost two out of three respondents believed that people who take medication for hypertension have side effects but only one out of three reported that they have actually experienced side effects.

- **Medication for hypertension and addiction due to long-term use.**

Similar results were given regarding addiction to medication and personal experience and beliefs. Fifty nine percent believe that people generally become addicted to the medication for hypertension due to long-term use but only 34% reported that they actually felt addicted. This difference was statistically significant (t = 10.2640 and p<0.001).

- **Medication for hypertension and dependence on it for life.**

The vast majority of the respondents (87%) believed that people who take antihypertensive medication are dependent on it for life. But again, only 73% stated

that they personally feel dependent on their medication and this difference was statistically significant ($t = 7.4967$, $p<0.001$).

Risk factors

Patients were asked whether they agree with the statement that untreated hypertension can lead to a) stroke, b) heart attack, c) heart failure and d) kidney failure. Results confirm what the evidence has shown (Alexander, Gordon et al. 2003); patients are highly aware that hypertension increases the risk of developing stroke (98%) and heart attack (89%), but they are less aware of the fact that it increases the risk of heart failure (82%) and kidney disease (67%) (Figure 5.4).

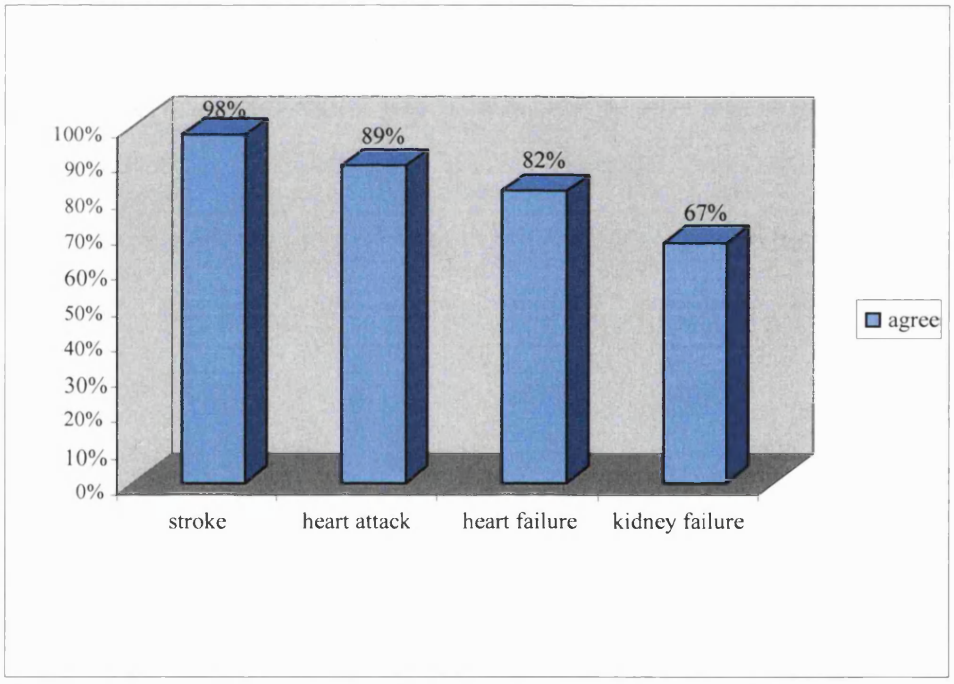


Figure 5.4: Untreated hypertension can lead to...

Patients were also asked to report which of the two types of hypertension, systolic or diastolic, is more important for the development of other diseases. Although the literature shows that the systolic blood pressure is a more important risk factor (Basile 2002) and guidelines in the US highlight this (Izzo, Levy et al. 2000) the patients seemed not to be aware of this. Only 12% reported that systolic blood pressure was the most important risk factor, 41% reported diastolic pressure and

44% said they were both equally serious. Again these findings are in agreement with what previous studies have shown (Alexander, Gordon et al. 2003).

Non-adherence to medication

Table 5.6 shows the frequency of the responses to the combined items of the scale. The answers are very close to the responses of the original Morisky et al. study (1986), where the proportions were 43%, 24%, 17%, 7%, and 9% respectively.

Table 5.6: Patient Responses to Morisky Scale

Patient Answered "yes" to:	n	% of valid
0 items	312	48
1 item	165	25
2 items	99	15
3 items	59	9
4 items	14	2
Total	649	100

Non-adherence rates were very low. As discussed in Section 2.3, Shalansky et al. (2004) argue that the threshold score for the Morisky scale may differ depending on the rate of non-adherence and in cases where they are low he suggests that a cutting off point of ≥ 2 may be used. This suggestion was followed and therefore the threshold of ≥ 2 was used. That means that as 'non-adherent' we denoted those respondents who had answered 'yes' to at least two of the questions of the scale. All other respondents were defined as 'adherent'.

5.3.4 Determinants of non-adherence

In general, the results in the tables below show that perceptions concerning the doctor-patient relationship are the strongest predictors of non-adherence. Information was also shown to be an important determinant of patients' decision to follow recommendations, especially knowledge regarding medication for hypertension. Also, the importance of experience with medication affects patients' behaviour and so does the perception that untreated hypertension increases the risk of kidney failure. However, demographic and clinical characteristics did not

significantly predict non-adherence. We now consider each group of determinants in more detail.

Doctor-patient relationship

The perceptions patients have about the role of their doctor were strong predictors of their decision to adhere. When controlling for sex, age, education and income, as well as health status, three of the statements regarding the doctor-patient relationship were significant predictors of non-adherence.

More specifically, patients who believed that it is best to follow the doctor's advice were less likely to non-adhere. On the other hand, those who believe that doctors use words that are difficult to understand and keep the whole truth from them are more likely to non-adhere (Table 5.7). Given that difficulty to understand the doctor's instructions may be associated with age and education we tested for the impact of these interaction effects. Indeed, believing that doctors use difficult language was associated with non-adherence to medication even when the interaction effect of this belief with age and education was considered (Appendix B2.1-B2.2). The association was even stronger when the interaction terms were included.

The findings show that trust in the doctor's expertise as well as his/her ability to clearly communicate with the patient and tell the truth were the factors that mostly affect non-adherence to medication.

Table 5.7: Impact of doctor-patient relationship on non-adherence

	Coef.	Std. Err.	P>t	95% C.I.	
Demographic and socioeconomic factors					
sex (0=male 1=female)	-0.0665	0.1510	0.6600	-0.3633	0.2302
age (years)	-0.0183	0.0060	0.0030	-0.0301	-0.006
education (0=primary education)					
secondary	-0.2004	0.1979	0.3120	-0.5893	0.1885
tertiary	-0.0690	0.2182	0.7520	-0.4979	0.3598
feeling about household's income (0=living comfortably)					
coping on present income	0.0011	0.1829	0.9950	-0.3583	0.3604
difficult on present income	0.2925	0.2272	0.1990	-0.1540	0.7390
very difficult on present income	0.0428	0.2976	0.8860	-0.5420	0.6276
Health status					
health (0=very good)					
fair	-0.0745	0.1867	0.6900	-0.4415	0.2924
bad	-0.2009	0.2830	0.4780	-0.7570	0.3552
hampered in daily activity (0=no 1=yes)	0.2533	0.1744	0.1470	-0.0895	0.5961
Doctor-patient relationship					
believe illnesses cure themselves without visiting a doctor *	0.0378	0.2184	0.8630	-0.3915	0.4671
believe people rely too much on doctors *	0.0146	0.1571	0.9260	-0.2942	0.3234
believe when people sure of medicine doctor should prescribe *	-0.1663	0.1489	0.2650	-0.4588	0.1262
believe it's best to follow doctor's advice *	-1.5491	0.4700	0.0010	-2.4727	-0.6255
feel disappointed when leaving without prescription *	0.0003	0.2394	0.9990	-0.4702	0.4708
believe doctors keep the whole truth **	0.3244	0.1624	0.0460	0.0053	0.6436
believe doctors discuss treatment before they decide **	0.0310	0.1514	0.8380	-0.2665	0.3285
believe patients are reluctant to ask questions **	0.0968	0.1543	0.5310	-0.2063	0.3999
believe doctors admit their mistakes **	0.0421	0.1983	0.8320	-0.3475	0.4317
believe doctors use words patients find difficult to understand **	0.3008	0.1540	0.0510	-0.0017	0.6034
_cons	1.8184	0.6445	0.0050	0.5518	3.0850

* 0=not agree, 1=agree

** 0=no & to some extent, 1=yes

Also, during the last consultation, those who were satisfied overall with the consultation were less likely to non-adhere (Table 5.8). Satisfaction with consultation is an important factor that has been discussed in the relevant literature and has been shown to affect patients' decisions to non-adhere to medical recommendation (Bultman and Svarstad 2000; Ward, Morisky et al. 2000).

Table 5.8: Impact of last consultation on non-adherence

	Coef.	Std. Err.	P>t	95% C.I.	
Demographic and socioeconomic factors					
sex (0=male 1=female)	-0.0189	0.1361	0.889	-0.2862	0.2483
age (years)	-0.0156	0.0055	0.004	-0.0263	-0.0049
education (0=primary education)					
secondary	-0.2681	0.1539	0.082	-0.5703	0.0342
tertiary	-0.3779	0.1583	0.017	-0.6889	-0.0670
During the last consultation ...					
...the doctor did not have time (0=no 1=yes)	0.1368	0.1557	0.38	-0.1689	0.4425
...did not discuss about medication (0=no 1=yes)	0.2121	0.1788	0.236	-0.1389	0.5632
...did not explain about medication (0=no 1=yes)	-0.2417	0.1566	0.123	-0.5492	0.0657
...I was satisfied with consultation (0=no 1=yes)	-0.4744	0.2484	0.057	-0.9623	0.0133
constant	0.9237	0.3909	0.018	0.1561	1.6912

Information

Information regarding medication was a significant determinant of non-adherence. Those who reported that they felt well informed regarding the medication for hypertension were less likely to non-adhere ($b=-0.373$, $p<0.05$). On the other hand, information regarding their condition was not a significant predictor of non-adherence (Table 5.9).

This is an interesting result, especially when compared with some findings presented above (Section 5.3.3), showing that people feel better informed about their condition than they do about their medication. From the results it follows that it is this information about the medication that is more important for patients' to adhere.

Table 5.9: Impact of information on non-adherence

	Coef.	St. Err.	P>t	95% C.I.	
Demographic and socioeconomic factors					
sex (0=male 1=female)	-0.0740	0.1314	0.5740	-0.3320	0.1841
age (years)	-0.0163	0.0057	0.0040	-0.0275	-0.0052
education (0=primary education)					
secondary	-0.2952	0.1696	0.0820	-0.6283	0.0380
tertiary	-0.2836	0.1732	0.1020	-0.6238	0.0566
feeling about household's income (0=living comfortably)					
coping on present income	-0.0914	0.1650	0.5800	-0.4154	0.2326
difficult on present income	0.2331	0.2139	0.2760	-0.1869	0.6531
very difficult on present income	0.1129	0.2539	0.6570	-0.3858	0.6116
well informed about hypertension (0=no 1=yes)	-0.1383	0.2149	0.5200	-0.5602	0.2836
well informed about medication (0=no 1=yes)	-0.3736	0.1809	0.0390	-0.7290	-0.0183
Sources of information regarding blood-pressure					
Family/Friends (0=no 1=yes)	0.7004	0.6415	0.2750	-0.5595	1.9603
Doctor (0=no 1=yes)	-0.2131	0.5087	0.6750	-1.2121	0.7859
Pharmacist (0=no 1=yes)	-0.0243	0.2894	0.9330	-0.5927	0.5441
Media (TV, Radio, Newspaper) (0=no 1=yes)	-1.2691	0.5630	0.0250	-2.3748	-0.1633
Internet (0=no 1=yes)	-1.2067	0.6475	0.0630	-2.4784	0.0650
Magazines on health issues and nutrition (0=no 1=yes)	0.4390	0.3573	0.2200	-0.2627	1.1407
Other sources (0=no 1=yes)	0.5849	0.7787	0.4530	-0.9444	2.1142
_constant	1.2078	0.6916	0.0810	-0.1504	2.5661

The sources of information that predicted non-adherence were the Media and Internet. Respondents who reported they had used these sources to get information regarding their prescribed medication for hypertension were less likely to non-adhere to it (b=-1.269, $p<0.05$ and b=-1.21, $p<0.1$ respectively).

Beliefs and actual experience

It was shown above in this chapter that what people believe about medication is not always compatible with their own actual experiences. It is now of interest to examine which of the two groups of questions are better determinants of non-adherence.

Table 5.10 presents the results of the probit model run with the belief factors, controlled for age, sex, education and income. From all the factors included in the regression only one was statistically significant. That is, when patients believe that hypertension can be treated without medication they are more likely to non-adhere than those who do not (b=0.397, p<0.05). All other factors were shown not to be statistically significant.

Table 5.10: Impact of beliefs on non-adherence

	Coef.	Std. Err.	P>t	95% C.I.	
Demographic and socioeconomic factors					
sex (0=male 1=female)	-0.0797	0.1432	0.578	-0.361	0.202
age (years)	-0.0163	0.0058	0.005	-0.027	-0.005
education (0=primary education)					
secondary	-0.2188	0.1837	0.234	-0.579	0.142
tertiary	-0.1661	0.2033	0.414	-0.565	0.233
feeling about household's income (0=living comfortably)					
coping on present income	-0.1414	0.1853	0.446	-0.505	0.222
difficult on present income	0.3644	0.2202	0.099	-0.068	0.797
very difficult on present income	0.3549	0.2947	0.229	-0.224	0.933
Beliefs on adherence					
believe hypertension can be treated without med (0=no 1 yes)	0.3979	0.1648	0.016	0.074	0.721
believe hypertension can be regulated with med (0=no 1=yes)	-0.3602	0.2242	0.109	-0.801	0.080
believe meds for hypertension have side-effects (0=no 1=yes)	-0.0324	0.1663	0.846	-0.359	0.294
believe medications for hypertension are addictive (0=no 1=yes)	0.1686	0.1645	0.306	-0.154	0.491
believe medications for hypertension make patients dependent (0=no 1=yes)	0.3143	0.2274	0.168	-0.132	0.761
_cons	0.2691	0.4905	0.584	-0.694	1.232

On the other hand, Table 5.11 shows the results of the probit model when only factors referring to the actual experience are included, controlled again for sex, age, education and income. Results show that patients who had actually tried to treat hypertension without medication were significantly more likely to non-adhere (b=0.391, p<0.0130). On the other hand, those who responded that they have managed to regulate hypertension with medication were less likely to non-adhere (b=-0.541, p<0.05). Finally, a striking finding is that patients who reported they had become addicted to medication for hypertension were less likely to be non-adherent

(b=-0.283, p<0.1). A possible explanation is that the patient may perceive addiction as a need of the body to continue taking the medication. Side-effects were not a significant predictor of non-adherence, neither as belief nor as an experienced fact.

Table 5.11: Impact of experience on non-adherence

	Coef.	Std. Err.	P>t	95% C.I.	
Demographic and socioeconomic factors					
sex (0=male 1=female)	-0.1521	0.1421	0.2850	-0.4313	0.1270
age (years)	-0.0105	0.0060	0.0800	-0.0223	0.0013
education (0=primary education)					
secondary	-0.4581	0.1729	0.0080	-0.7978	-0.1184
tertiary	-0.4766	0.1822	0.0090	-0.8346	-0.1186
feeling about household's income (0=living comfortably)					
coping on present income	-0.1153	0.1871	0.5380	-0.4829	0.2522
difficult on present income	0.1558	0.2180	0.4750	-0.2725	0.5841
very difficult on present income	0.1520	0.2810	0.5890	-0.4000	0.7041
Personal experience					
I have treated hypertension without meds (0=no 1=yes)	0.3916	0.1567	0.0130	0.0838	0.6994
I have regulated hypertension with meds (0=no 1=yes)	-0.5419	0.2194	0.0140	-0.9729	-0.1109
I have experienced side-effects because of meds (0=no 1=yes)	-0.0049	0.1461	0.9730	-0.2919	0.2820
I have become addicted to meds for hypertension (0=no 1=yes)	-0.2830	0.1511	0.0620	-0.5799	0.0139
I have become dependent on meds for hypertension (0=no 1=yes)	-0.1018	0.1780	0.5680	-0.4514	0.2479
_cons	0.8867	0.4568	0.0530	-0.0107	1.7841

To sum up, it seems from the analysis that actual experience with medication is a stronger predictor of non-adherence than what the patient believed about it.

Risk factors

Among the risk factors only one was statistically significant in predicting non-adherence. Patients who believe that untreated hypertension due to non-adherence may lead to kidney failure were less likely to non-adhere to the prescribed medication (b=-0.347, p<0.05). A possible explanation of non-adherence is that patients are less aware that untreated hypertension is associated with a higher risk of kidney failure. This was also shown in Figure 5.4 above. Hence, the finding may

indicate that awareness of the risk of kidney failure is a predictor of better adherence.

Table 5.12: Impact of risk factors on non-adherence

	Coef.	Std. Err.	P>t	95% C.I.	
Demographic and socioeconomic factors					
sex (0=male 1=female)	-0.0151	0.1346	0.9110	-0.279	0.249
age (years)	-0.0169	0.0052	0.0010	-0.027	-0.006
education (0=primary education)					
secondary	-0.2016	0.1602	0.2090	-0.516	0.113
tertiary	-0.2430	0.1742	0.1630	-0.585	0.099
feeling about household's income (0=living comfortably)					
coping on present income	-0.0075	0.1655	0.9640	-0.332	0.317
difficult on present income	0.3280	0.2090	0.1170	-0.082	0.738
very difficult on present income	0.2783	0.2706	0.3040	-0.253	0.809
Health status					
health (0=(very good)					
fair	0.0667	0.1584	0.6740	-0.244	0.377
bad	-0.0747	0.2432	0.7590	-0.552	0.402
hampered in daily activity (0=no 1=yes)	0.2497	0.1568	0.1120	-0.058	0.557
Risk factors					
untreated hypertension can lead to stroke (0=no 1=yes)	0.9034	0.5509	0.1020	-0.178	1.985
untreated hypertension can lead to heart attack (0=no 1=yes)	-0.1458	0.2465	0.5540	-0.629	0.338
untreated hypertension can lead to heart failure (0=no 1=yes)	0.1094	0.1947	0.5740	-0.272	0.4917
untreated hypertension can lead to kidney failure (0=no 1=yes)	-0.3474	0.1465	0.0180	-0.635	-0.0597
cons	-0.2599	0.6882	0.7060	-1.611	1.0916

Demographic factors

Results of the probit analysis including demographic factors are shown in Table 5.13. Only age and education were significant predictors of non-adherence. The effect of age confirmed our initial hypothesis; it is negative up to a point, demonstrating that older people adhere more to the medication. After this point however the effect is negative meaning that after a certain age older age is associated with worse adherence rates, possibly due to memory loss or other behavioural effects. In addition, more educated patients are less likely to non-adhere.

All other demographic and socioeconomic factors were not significantly associated with patients' decision to follow recommendations.

The findings confirm what the review of the empirical studies showed, i.e. that the impact of demographic factors is not always clear.

Table 5.13: Impact of demographic factors on non-adherence

	Coef.	Std. Err.	P>t	95% C.I.	
sex (0=male 1=female)	-0.0416	0.1333	0.755	-0.3033	0.2202
age (years)	-0.0175	0.0056	0.002	-0.0285	-0.0066
age squared (years squared)	0.0005	0.0003	0.099	-0.0001	0.0010
married (0=no 1=yes)	0.1569	0.1891	0.407	-0.2144	0.5283
education (0=primary education)					
secondary	-0.2173	0.1704	0.203	-0.5519	0.1174
tertiary	-0.3062	0.1776	0.085	-0.6552	0.0427
children (0=no 1=yes)	0.1846	0.2616	0.481	-0.3292	0.6983
living alone (0=no 1=yes)	0.0567	0.1599	0.723	-0.2575	0.3708
feeling about household's income (0=living comfortably)					
coping on present income	-0.0034	0.1684	0.984	-0.334	0.3273
difficult on present income	0.3255	0.2066	0.116	-0.0802	0.7313
very difficult on present income	0.2126	0.2622	0.418	-0.302	0.7276
Constant	0.2614	0.4428	0.555	-0.6081	1.1310

Clinical Factors

Controlling for sex, age and health status, none of the clinical factors was significantly associated with non-adherence (Table 5.14). Having a more severe condition, such as heart failure or a stroke, was not associated with lower adherence rates. Hypertension is an asymptomatic condition and one would have expected that patients with more severe illnesses would be more aware of its consequences, yet this is not confirmed here. Similarly, the duration of the disease, or taking other medication was not a predictor of non-adherence rates, as might have been expected.

The findings show that the severity of the condition does not necessarily impact on patients' decision to adhere. This is in agreement with previous empirical studies (Mann, Eliasson et al. 1992).

Table 5.14: Impact of clinical factors on non-adherence

	Coef.	St. Err.	P>t	95% C.I.	
Demographic factors and health					
sex (0=male 1=female)	-0.1869	0.1351	0.167	-0.4525	0.0786
age (years)	-0.0164	0.0056	0.003	-0.0273	-0.0055
health (0=(very good)					
fair	0.0026	0.1829	0.989	-0.3567	0.3619
bad	-0.2892	0.2899	0.319	-0.8589	0.2806
hampered in daily activity (0=no 1=yes)	0.1568	0.1849	0.397	-0.2066	0.5201
Clinical factors					
duration of hypertension (years)	0.0078	0.0089	0.38	-0.0096	0.0254
dislepidemia (0=no 1=yes)	-0.0759	0.1499	0.613	-0.3705	0.2186
CHD (0=no 1=yes)	0.1481	0.3237	0.647	-0.4879	0.7842
diabetes (0=no 1=yes)	0.1752	0.2011	0.384	-0.2201	0.5704
stroke (0=no 1=yes)	-0.0259	0.4040	0.949	-0.8197	0.7679
heartfailure (0=no 1=yes)	-0.9025	0.6829	0.187	-2.2445	0.4394
constant	0.2447	0.3548	0.491	-0.4524	0.9418

5.4 Limitations

A statistical analysis summarises relevant data, sometimes in a raw and unprocessed form, and produces sharp and clear results and explanations. Such an analysis is extremely useful but it is based on technical assumptions and the availability of data, which of course means that not all finer aspects of reality are always captured. Therefore, the limitations of our study are considered below.

Self-reported non-adherence

The method of self-reported measurement of non-adherence has been used widely but there is no gold standard method for measuring non-adherence. However, self-report was the most appropriate method of measuring non-adherence in the present study, given that other methods, such as electronic monitoring, or prescription refill were not available.

Low internal reliability of the Morisky scale

As mentioned above, Cronbach's alpha is a coefficient which depends on the number of items the scale has (Bland and Altman 1997) and therefore a scale with only four items is expected to have a lower alpha. Here Cronbach's alpha was low, i.e. 0.55, yet not much lower than the one reported in the original study by Morisky, where it was 0.61 (Morisky, Green et al. 1986). However, the selection of the Morisky scale was based on the fact that it is quick, simple and comprehensible and that it had been used and tested in previous studies for its validity and reliability.

Cross-sectional study

The patients were interviewed once and were not followed up, although in hypertension, as in most chronic conditions, non-adherence to medication is not a static phenomenon. It is a long-term process that may change as patients live with the condition. However, the aim of the present study was to identify general beliefs and attitudes towards medication and see how these may affect patients' decision to adhere or not.

Setting of study

The study cohort had some unique characteristics which may limit the ability to extrapolate the results to other populations. The Clinic of Hypertension in the Hippocration General Hospital in Athens is one of the few specialised clinics for the treatment in Greece. Therefore, patients visiting the clinic may be more determined to deal with hypertension than a patient with the same condition visiting a family doctor. However, identifying a more general group of hypertensive patients would be particularly difficult given the lack of GP lists in the Greek health system. Therefore, despite the special characteristics of the group under study, the sample was a unique opportunity to gather information from patients with hypertension.

5.5 Discussion and policy implications

This section discusses the findings of the analysis of the questionnaire survey, with respect to the hypothesis and the research questions set at the beginning of the chapter. More general discussion on policy implications of the findings appears in Chapter 7.

Q4: *What do Greek patients with hypertension think of their doctors and how does this affect their attitudes towards medicines?*

Non-adherence rates among the hypertensive patients under study were shown to be particularly low. The results were close to the original study by Morisky and reveal that the sample studied here was mostly adherent to the medication. As discussed in the limitations, a possible explanation may be hidden in the fact that the sample was taken from a specialised centre. The Centre for the treatment of Hypertension in the Hippocration General Hospital in Athens is one of the most well known centres for the treatment of hypertension in Greece. The hospital specialises in the treatment of all cardiovascular conditions. Therefore, patients visiting the centre may be more determined in treating hypertension and this may partly explain the high adherence rates.

As far as the doctor-patient relationship is concerned the patients seem generally very satisfied with the consultation and express themselves positively in statements regarding doctors. However, they felt that the doctor explained to them more about their condition, less about the prescribed medication and even less about side effects. Similarly, they felt that they discussed with their doctor more about their condition and less about their medication.

The perceptions patients hold regarding their doctors were very strong predictors of their decision to follow their recommendations. Patients who believed that it is best to follow the doctor's advice were less likely to non-adhere. However, those who think that doctors use words that are difficult to understand and keep the whole truth from them are more likely to non-adhere. Finally, during the last consultation, patients who were satisfied overall with the consultation were less likely to non-adhere.

Q5: *Which information channels do patients use and how do these channels influence patients' behaviour towards medicines? What is the importance of doctors in supplying information?*

Analysis showed interesting results regarding information sources and their impact on adherence. It is clear that the doctor was the dominant information source for the patients both regarding their medication and their condition. Also, patients reported being better informed regarding their conditions than they are regarding the medication they are prescribed.

Another source of information that was shown to be important was the Media. In fact, this information source was reported more often than the other sources, such as family and the pharmacist. Finally, the Internet was not a popular source of information. Apart from the doctor patients do not look for information in many other sources.

What is more, lack of information regarding medication was a significant predictor of non-adherence. It is therefore the information regarding medication rather than the condition that predicts whether patients will adhere or not.

Q6: *What other factors may affect non-adherence? Is it beliefs towards the disease and the treatment or the disease and treatment characteristics themselves that influence non-adherence?*

Research question Q3 considered beliefs towards the disease and treatment in comparison to actual disease and treatment characteristics and their influence on non-adherence. Beliefs and personal experiences varied significantly. More people believed that medications have side-effects, are addictive and make patients dependent on them but when asked whether they had actually experienced any side-effects, sign of addiction or dependency, responses were considerably lower. Results of the regression analysis indicated that most of the statements on experienced characteristics were significant predictors of non-adherence while the statements on beliefs regarding similar issues were not.

Socio-demographic factors were not strong predictors of non-adherence. Only two demographic factors were significant. Older patients were less likely to non-adhere

and so were those with higher education. However, none of the clinical factors was significantly associated with non-adherence.

Overall, hypothesis **H2** was confirmed by the statistical study. Patients' perceptions of the doctors' role had a great impact on their decision to follow recommendations.

The study identified a number of points that are interesting from a policy perspective. To begin with, the statistical analysis showed that the doctor-patient relationship and the way the patients perceive it plays an important role in their decision to adhere to the recommendations. In fact, of all the factors examined here, the perceptions of the doctor-patient relationship were the strongest predictors of adherence. In particular, believing that it is important to follow the doctor's advice, understanding the terminology they use and feeling she is telling the truth were predictors of better adherence.

In general, the findings confirm the tendency to depart from the traditional misconception that non-adherence is a patient driven problem. The doctor's role is important in helping patients to adhere and there is need to support them instead of blaming them.

Patients seem to be more informed about their condition and less informed about the medication. What is more, lack of information regarding medication was a strong predictor of non-adherence. Doctors need to identify the patients who are seeking more information regarding their medication and pass it on to them. It seems that both parties would benefit from this as the patient will be more likely to follow the advice and therefore get better health outcomes.

5.6 Conclusions

This chapter aimed at shedding light on non-adherence to medication among a specific group of hypertensive patients in Greece. For this purpose, a questionnaire survey was designed, administrated and analysed. The survey took place in the Centre for the Treatment of Hypertension, in the Hippocration General Hospital in Athens, Greece. Seven hundred and forty-three patients were interviewed and were questioned regarding their relationship with their doctors, the sources they use to get

information about hypertension and the medication as well as risk factors and other clinical characteristics.

The analysis showed that the Greek patients are mostly adherent to the prescribed medication. The main factors affecting their decision were their good perceptions of their relationship with the doctors. They generally think highly of their doctors, they trust them and rely a great deal on their expertise.

Other factors affecting their decision to non-adhere included lack of information regarding their medication. In general, patients feel better informed regarding their conditions, less regarding their medication and even less regarding side-effects. Patients mainly rely on their doctors to get information and other sources they use are the Media and magazines on health issues and nutrition. Other sources, such as the pharmacist or Internet were very limited sources.

From a policy perspective, the aspects of the doctor-patient relationship that were shown to be important determinants of adherence were general satisfaction with the consultation, believing in the doctor's expertise, use of language that patients can understand and telling them the truth.

CHAPTER 6

DOCTOR-PATIENT RELATIONSHIP; A GAME THEORY APPROACH TO EXPLAIN NON-ADHERENCE

6.1 Introduction

The two empirical studies which we conducted and were presented in Chapters 4 and 5 of this thesis confirmed, both at a population and a patient level respectively, the factors that have been argued might affect an individual's decision to adhere to medication. The findings showed that the way individuals perceive the doctor-patient relationship and think about their doctor's role in the prescribing and treatment of illnesses were important predictors of their decision to adhere or not. Beliefs that the patients have towards medication and their illness were also associated with patients' departure from recommendations. The theoretical elements, such as self-efficacy, used to test the hypotheses of the empirical studies, successfully predicted part of the results.

However, the picture remains incomplete. Our studies identified some conflicts in the doctor-patient relationship – also reported widely in previous empirical work - that significantly affected patients' decision to non-adhere but which the theoretical elements used were not sufficient to explain. For example, patients who wanted more information during the consultation, but who reported that the doctor did not give them enough, failed to adhere to the doctor's recommendation.

In general, the theoretical models that are used to explain non-adherence as well as the models of the doctor-patient relationship need to be examined more in depth to see the degree to which they can capture the conflicts of this interaction and their ability to predict patients' decision not to follow recommendations. This is the objective we are pursuing in this chapter.

The upcoming field combining Psychology and Economics, commonly called Behavioural Economics, opens new ground for explaining behaviours that traditional models fail to capture. Particularly in the case of the doctor-patient relationship Behavioural Economics has made significant progress in the last few

years. Models in this field that describe doctor-patient interaction and patients' behaviour have incorporated the notion of beliefs into the patient's utility function and try to explain how these may lead to behaviours, such as avoiding visiting a doctor (Köszegi 2003). These models are based on the Psychological Expected Utility theory (henceforth PEU theory) introduced by Caplin and Leahy (2001). The theory is an extension of von Neumann-Morgenstern expected utility theory to situations in which agents experience feelings of anticipation regarding future states. This theory, when applied to health behaviour, allows for the patient's utility function to depend not only on physical outcomes but also on *beliefs* about future physical outcomes. However, all the above attempts to model the doctor-patient relationship are based on the assumption that the doctor is entirely empathetic to the patient and maximises the patient's utility function as if it were his own.

Evidence from the medical literature demonstrates contradictory results. The doctor-patient relationship is often characterised by antagonism and conflicts. Both parties have different expectations and agendas that they bring to the consultations which are often in conflict and when they are not met they result in undesirable situations such as non-adherence to medical recommendations (Britten, Stevenson et al. 2000). Of course, the consultation is influenced not only by the specific characteristics of the doctor and the patient but also by the context and the setting where the consultation occurs (Weinmann 1997).

The models we develop in this chapter extend previous Behavioural Economic models of doctor-patient interaction to examine how the actions of the two parties change when the notion of effort is incorporated into the model. Also, and most importantly, the models examine whether the introduction of the concept of effort may explain why consultations do not reach the desirable outcomes, i.e. lead patients to fail to adhere to medical recommendations.

The intention of this part of the thesis is to understand how background variables and assumptions, including differences in the types of patients and doctors, the possibility of lack of precise identification of the patient's needs by the doctor during the actual communication, as well as organisational constraints such as effort, affect the actual communication and may explain non-adherence to recommendations.

This causality is better illustrated in Figure 6.1.

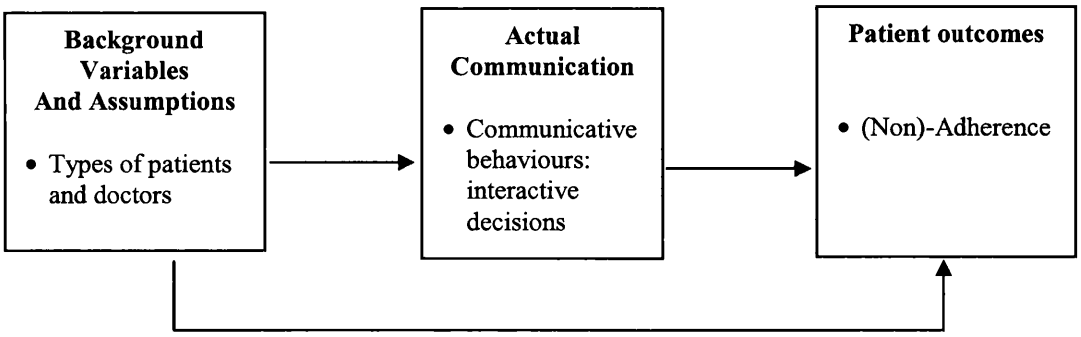


Figure 6.1: Association between background variables, communication and adherence.

The hypothesis tested in this chapter is:

H3: A game theoretical approach that captures the patients' preferences for information and doctor's inability to understand them may explain why patients fail to adhere to medical recommendations.

To test the hypothesis the following related research questions need to be answered:

- **Q7:** Do previous theoretical models of the doctor-patient relationship explain differences between the two parties that may lead to non-adherence?
- **Q8:** How does a game theoretical model capture these differences?

The rest of this chapter is organized in the following way. Section 6.2 begins by summarising some earlier discussed motivating facts from the medical literature that show how conflicting aspects of the doctor-patient relationship influence patients' decisions to adhere or not to recommendations. Particular emphasis is given to the supply of information during the consultation and how this affects communication. It then challenges previous models on the doctor-patient relationship both from Health Psychology and Economics, with respect to their ability to capture the conflicts that occur during consultation. The chapter then presents our game theoretical model and is intended to explain the doctor-patient interaction and conflict. It introduces new ideas, such as the notion of effort as a

new variable. Limitations as well as possible directions for future research are then discussed. Finally, the last section discusses the policy implications and concludes.

6.2 Motivating facts

The purpose of this section is to present the motivating facts that lead to the conceptualisation of the models presented in Section 6.3. It begins with evidence from the medical literature that identifies differences between patient and doctor needs during consultation and how these, when not met, may be linked to non-adherence to recommendations. Particular emphasis is given to issues concerning the supply of information. It then briefly discusses the models of doctor-patient relationship reviewed in Chapter 2 with the purpose of identifying whether they can capture these conflicts, or whether they can provide useful insights for our models. Finally, the section concludes with a discussion of the elements on which the game theory model will be built.

6.2.1 Empirical evidence

There is consistent evidence showing that the flow of information exchanged during the consultation is very critical for the formulation of diagnosis and the organisation of treatment (Lambert and Loiselle 2007). Thus, effective communication is necessary to ensure not only that the doctor understands the patients' problems and concerns but also that relevant information on diagnosis and treatment is accurately and effectively transferred to maximising benefits from consultation. Input factors which influence the consultation include both aspects of the doctor's and the patient's behaviour but also the context and setting in which this occurs (Weinmann 1997).

The literature shows that the patient's emotions and beliefs influence his decision on whether to adhere or not (Horne, Sumner et al. 2001). There is evidence that information regarding patients' health affects their emotions and patients vary in their preferences regarding how much they want to know about their health (Miller and Mangan 1983). Not all patients want information or benefit from it. For example, a study by Siminoff and Fetting (1991) found that patients who did not

accept their physician's treatment recommendations were told in more specific terms what the benefits of the treatment would be. The study therefore suggests that provision of detailed information will not always provide desirable results and in fact may lead to different therapy decisions than the physicians might hope for.

Doctors, on the other hand, with their communication style, can positively influence these beliefs and therefore lead to better adherence to recommendations (Bultman and Svarstad 2000). However, they are many times unable to understand differences in patient preferences regarding information and participation during consultation (Elkin, Kim et al. 2007). They often fail to listen to patients and explore their views on their disease and medication. Moreover, the doctor, just like the patient, also experiences feelings during the consultation such as anxiety or anger, which have been shown to decrease the overall satisfaction of both parties with the consultation and also the patient's adherence to recommendations (Waitzkin 1984).

In addition, and more importantly for our model, the transmission (supply) of information during the doctor-patient interaction has been shown in the literature to be related to the clinical setting (Waitzkin 1984). Busy clinical settings often imply that the doctor may be restricted in the time he can spend with every patient. However, the effect of time on consultation outcomes is controversial. Some studies show that more time does not necessarily lead to better outcomes while other researchers suggest that optimal patient-provider communication requires longer consultations (Brown 2004). Despite the debate, longer consultations clearly indicate that more information is transferred to the patient.

To sum up the evidence from the medical literature, the supply of information is a very important issue during the consultation. Patients vary in their preferences regarding how much information they want to receive and doctors often fail to recognise these variations. This disconnection with patient's needs may lead to unwanted results, such as decreased patient satisfaction with the consultation and higher rates of non-adherence.

6.2.2 Review of previous theoretical models

The models reviewed here, which describe the doctor-patient relationship and aim to explain the behaviour of the two parties, come from two main areas, Health Psychology and Economics.

In Health Psychology, as was explained in Chapter 2 in more detail, three main models are commonly accepted: paternalism, shared decision and informed decision making. Despite their differences, the three models share a common characteristic. The roles of the two parties regarding supply of information and decision making are clearly defined and do not allow for antagonism between the doctor and the patient. Hence, they do not permit for inconsistency and conflict in decision making and cannot explain how differences between the two parties during the consultation can affect patients' decisions.

In Health Economics also the doctor-patient relationship is of central importance and theories to describe it have been a great challenge for researchers in the area. The perfect-agency model has been very useful in understanding aspects of the doctor-patient relationship. However, it assumes that the doctor and the patient have identical utility function, therefore it fails to capture conflicts between the two parties. It also seems unrealistic for the perfect agency model to work in medical practice as the doctor, apart from the patient's needs has other constraints as well during the consultation which must be taken into consideration, such as administrative constraints, time issues and personal interest.

Departing from the perfect-agency model, there is an extensive literature on how physicians can act beyond maximising the patient's utility function only (Evans 1974; McGuire 2000). Scott (2000) reviews the model of GP's behaviour and notes that economic models allow doctors' behaviour to be driven not only by altruistic elements but also other aspects such as workload, income, reputation and other self-interest factors.

Le Grand (2006), in his influential work, describes the two different aspects of the doctor's behaviour as knightly and knavish and notes that it is "perfectly possible

for someone to be both a knight and a knave: that is, to have altruistic motivations for some of his activities or behaviour and self-interested ones for others".

On the patient's side, the literature of Health Economics is more limited in modelling patient's behaviour. The lately increasing field of Behavioural Economics has resulted in models that offer useful insight into what drives patients' decisions by introducing the notion of beliefs into patient's utility function. The PEU theory (Caplin and Leahy 2001) has been used successfully to describe certain aspects of the doctor-patient relationship (Caplin and Leahy 2004) and patients' behaviour (Köszegi 2003). However, these models assume a perfect agency relationship between the doctor and the patient, i.e. the doctor maximises the patient's utility as if it were his own.

To sum up, former traditional economic models vary in the way they approach the issue of the doctor's utility function but in general they include, apart from the altruistic element, effort, a leisure-income element, as well as reputation and organisational characteristics. However, they do not allow for differences in information preferences. On the other hand, models of Behavioural Economics using PEU theory capture variations in information preferences, but they assume a perfect agency relationship between the doctor and the patient.

The choice of a Game theory approach

Game theory provides a formal means for explaining optimal strategies under conditions of uncertainty in which the outcomes depend on choices of more than one individual. This is the reason why this approach is proposed for the doctor-patient relationship as the final outcomes for both parties depend not only on their individual actions but also on what the other person will also do.

The potential use of game theory in describing the doctor-patient interaction has been receiving increasing interest from researchers in recent years. The evidence from empirical studies that agreement is not always reached during consultation has initiated thoughts on the potential use of game theory to describe it (Elliott, Shinogle et al. 2008). Tarrant et al (2004) discuss three main game structures: the Prisoner's Dilemma game, the Assurance game and the Centipede game, but this is

more of a general discussion and explorations of the opportunities and limitations of game theory and not a proposal for a formal model. Although discussions on the new perspective that game theory provides for research into the medical consultation are mainly theoretical debates they all agree on the potentiality of this new area of research. Game theory can provide the basis for empirically testable models of the doctor-patient relationship.

6.2.3 Combining health psychology and economics in our models

Following the discussion above, four aspects of the doctor-patient relationship that affect non-adherence are important for our model. First, information affects patients' beliefs and these have an impact on patients' decisions regarding treatment. Secondly, patients vary in their preferences regarding information. Some patients want information, some others feel better when they do not know much about their condition and treatment. Models based on the PEU theory take this into account. Thirdly, doctors do not appear to be consistently able to predict patient preferences. This may be due to organisational constraints that restrict the doctor from spending time with the patients or may be due to a lack of adequate training or due to self-interest. Finally, the doctor's disconnection with the patient's needs may lead to unwanted results, such as dissatisfaction with consultation and non-adherence to medical recommendations.

We now combine all these elements to develop our non-cooperative game theoretical models. They are a development of previous Behavioural Economic models of doctor-patient interaction. They incorporate the notions of anxiety, effort, etc. and relax the assumption of a perfect agency relationship, in order to explain conflicts that occur during the consultation which may lead to non-adherence to recommendations.

6.3 The models

The models presented here attempt with a key number of variables and relations to capture the salient characteristics of a specific empirical area and their aim is to

make predictions. These are compared with real evidence and can also explain the findings of the empirical parts of the thesis.

This section presents three models of the doctor-patient interaction to describe the supply of information by the doctor during consultation. The models take the form of a game in an extensive form. They are all non-cooperative games between two players, the patient ('he') who has symptoms of an illness and visits the doctor ('she') to get a diagnosis. The doctor makes the diagnosis and has to decide how much information to pass on to the patient. Patients, however, vary in their preferences regarding how much detailed information they want to receive and, following the work by Miller et al (1987), are distinguished between 'blunters', i.e. information-averse patients, and 'monitors', i.e. information-loving patients. The patient, after the information received from the doctor, needs to decide whether to accept the recommendations and adhere to them or not.

The first two models are based on the assumption that the doctor knows perfectly the type of patient. The first one assumes that the patient is a blunter while the second assumes that the patient is a monitor. The third model presents a game closer to reality. In this case the doctor cannot tell with certainty whether the patient is a monitor or a blunter. Empirical evidence presented earlier in the chapter (see Section 6.2.1 for more details) shows that indeed doctors very often fail to capture the patient's preference for information (Elkin, Kim et al. 2007). Model 3 is the most involved game of the three but also the one that explains in the end how a doctor's failure to understand the patient's preference for more detailed information may lead to non-adherence to her recommendations.

The models presented below draw upon the PEU theory (Caplin and Leahy 2001). The PEU, as mentioned briefly in Section 6.2 above, is an extension of the expected utility theory in situations in which agents experience acute feelings of anticipation prior to the resolution of uncertainty. It has been used by Caplin and Leahy to explain supply of information during the consultation (Caplin and Leahy 2004) and by Köszegi to understand patients' behaviour (Köszegi 2003). Köszegi (2003) confines himself to a model that explains the patient's decision on whether to visit a doctor or not, when anxiety enters his utility function. Caplin and Lealy (2004) present an extensive form game in which the patient signals his types and the

doctor, being completely empathetic, decides on how much information to pass on. This model does not allow the patient to play a part himself in deciding whether to accept the information or not.

The originality of the approach of the models presented in this section lies in two aspects. First, they relax the assumption of perfect agency that the models by Caplin and Leahy (2004) and Köszegi (2003) accept, i.e. that the doctor maximizes the patient's utility as if it is hers. In order to show that the doctor cannot act as a perfect agent the models assume that she needs to put effort into supplying information to the patient. Secondly, they allow for interdependent decisions with an active role both for the doctor, who needs to decide on how much effort to put in and for the patient as to whether to accept the doctor's recommendation.

The methodology adopted is that of game theory, which analyses interdependent decisions and their optimality in contrast to a more narrow decision theory approach which only looks at individual decisions. We set up extensive game trees, which explain the order in which players move, their available actions, the information they have regarding the game and their payoffs. In the case of Model 3, the uncertainty regarding the patient's preference for information is resolved under various hypotheses of bounded rationality. This is a well-known approach in economics for modelling problems with uncertainty so that progress in analysis can be made. The models offer, under specific but reasonable assumptions, a complete resolution of the games, i.e. obtain results concerning how much effort the doctor will put in and the patient's decision to adhere to the recommendations. They use comparative statics, give economic interpretations and finally allow for a discussion on the policy implications that they have.

6.3.1 Definitions and preliminaries

We explain here the notation used and, for the sake of completeness, the concepts employed in the models discussed:

- N denotes nature. This is a summary term which is used to denote all factors which determine the type of patient that comes to the doctor.

- There are two types of patient: blunters (B), i.e. information-averse patients, and monitors (M), i.e. information-loving ones. These types were introduced by Miller and Mangan (1983).
- q is the probability with which the doctor believes that nature chooses the patient to be a monitor and $1-q$ to be a blunter. The case where $q=\frac{1}{2}$ corresponds to bounded rationality discussed below. However, more general distributions are considered. q applies only in Model 3 where the doctor does not know the type of patient with certainty.
- s denotes the health state of the patient. It is defined in the interval (s_1, s_2) with probability density function $f(s)$. In other words, s_1 is the lowest level his health can be and s_2 the highest.
- p denotes the probability that the patient will be in state s_1 and $1-p$ that he will be in s_2.
- l is a non-negative constant that denotes a loss in health of the patient if he does not follow the doctor's recommendation. It is assumed to be common for all types of patients, i.e. it is independent of the patient's preference regarding information.
- T and NT are the two actions the doctor can take. T denotes that the doctor reveals the whole truth to the patient about his state of health, i.e. she tells the patient that he can be in state s_1 with probability p and in s_2 with $1-p$. NT denotes that the doctor does not reveal the whole picture but simply tells the patient that his expected state of health is $s = p \cdot s_1 + (1-p) \cdot s_2$.
- A and NA are the two actions available to the patient. A denotes that the patient will adhere to what the doctor recommends and NA that he will not.
- u_M and u_B are the utilities of a monitor, and a blunter respectively, while u_D is the utility of the doctor.
- ε_1 denotes the effort the doctor needs to put in to pass on the information to the blunter and ε_2 the effort she needs to put in if the patient is a monitor. Both ε_1 and ε_2 are positive constants and are subtracted from the doctor's utility function every time the doctor decides to play T. It is assumed that $\varepsilon_1 < \varepsilon_2$. That

is, more effort is needed to pass on information to a monitor, who is an information-seeking person, than to a blunter, who is information averse.

- a denotes the anger that is created if a monitor realises that the doctor has not told him all the truth. It is assumed that a is a positive constant and it is subtracted both from the monitor's and the doctor's utility. We assume that $a > \varepsilon_2$, i.e. the anger created if the doctor does not pass on all the information is greater than the effort the doctor puts in to do so.
- w denotes the worry that a monitor experiences if he decides to follow the doctor's advice although he has realised that she has not told him the truth. It is accepted that w is a positive constant and it is subtracted from the monitor's utility.

Non-cooperative games: These describe situations in which each player chooses his strategy independently from the others with the aim of maximising his own payoff. The idea is to find a pair of equilibrium strategies. On the other hand, cooperative games allow the players to negotiate before the game starts. The game is then played according to a binding agreement (Binmore 2007). The games in this chapter are all non-cooperative.

Extensive form games: These refer to non-cooperative games. They describe, in a precise way, the role of the players, the moves available to them, the order with which they can move and what information they have every time they are to move and finally the payoffs received when the game is over (Gibbons 1992).

A **game tree** is a graphical representation of the extensive form games. On a tree the movement is always downwards and a node is visited only once. Usually all moves made by nature are made at the beginning. These are the random moves.

A **node** denotes the point in the game that, when reached, a decision needs to be made by a player until the terminal node is reached, i.e. the game ends.

A **path** is a unique way of going from the initial node of the tree to a terminal. No two paths can intersect.

An **information set** is a collection of nodes such that the player, whose turn it is to act, cannot distinguish among them. In other words, if an information set includes more than one node the player does not know exactly at which of those nodes he is.

Games of perfect and imperfect information: A game is said to be of perfect information if every information set of the game contains only a single node, or in

other words, no player will then ever doubt about what has happened in the game so far (Binmore 1991).

Complete information requires all players to know everything about the structure of the game as well as the strategies and the payoffs available to other players.

Games of perfect recall: In games of perfect recall none of the players ever forgets what he once knew about the game (Glycopantis and Muir 1996).

Pure strategies: A pure strategy of a player in an extensive form game is a function that assigns an action to each information set of the players (Binmore 1991; Osborne and Rubinstein 1994; Glycopantis and Muir 1996).

Mixed strategies: A mixed strategy in an extensive form game is a probability distribution over the pure strategies (Glycopantis and Muir 1996).

Behavioural strategies: A behavioural strategy assigns independently to each of the player's information sets a probability distribution over the actions available at that set (Glycopantis and Muir 1996).

Backward induction: Backward induction is a method used to solve a game. The method requires starting from the end of the game and then working backwards to its beginning. Suppose there are two players. The last player chooses first what the best option for him is, knowing what the other player(s) has played. He will select whichever of the actions gives him the highest utility. The tree then folds up showing the options left for the first player. Similarly, he will now select the action that gives him the highest utility. This will eventually give the predicted solution for the game.

Bounded rationality: This describes how a rational choice should be made when the agent is constrained by the amount of information available and by his computational abilities (Simon 1957). Given this limited information the players take optimal decisions by maximising (expected) payoffs.

The principle of insufficient reason is based on the notion of bounded rationality. The rationale is that if there is no sufficient reason for a player to assume that his opponent will be of a particular type, then he treats all alternative types as equally probable (Luce and Raiffa 1957; Glycopantis and Muir 1994).

Optimal path: An optimal path describes a series of optimal decisions by the players and occurs with the probability of the initial move. The payoffs of the players are attached at every terminal node. In our models they refer to the utilities

of the doctor and the patient and will be discussed extensively below. Optimal decisions are reached in terms of expected utilities.

Nash equilibria (NE): A pair of strategies in a game of two players is a Nash equilibrium if each player's strategy is the best response to the other player's strategy (Binmore 1991). The Nash equilibrium, or Cournot-Nash equilibrium, is a confirmation of the beliefs of the agents concerning each other's strategies.

Subgame: This consists of an information set which is a singleton, i.e. a node, and the rest of the tree which stems from that node (Binmore 1991; Gibbons 1992).

Subgame perfect equilibria (SPE): this is a Nash equilibrium for every subgame. It is a refinement of a Nash equilibrium. It safeguards the agents against possible mistakes or irrational behaviour of their opponents.

Assessment equilibrium: This solution concept defines an equilibrium not only in terms of what the players do but also in terms of what they believe. It consists of a pair of behavioural strategies and beliefs for which two properties hold: a) the players, given their beliefs, always choose an optimal action and b) the beliefs are updated using other beliefs and actions taken, by applying Bayes' rule wherever possible (Binmore 1991).

Perfect Bayesian Equilibrium (PBE): A PBE consists of a set of optimal behavioural strategies and a set of players' beliefs which attach a probability distribution to the nodes of information sets. The strategies must be optimal given beliefs. The beliefs are formed from updating using the available information and they must support the optimal strategies. This concept must really be used when genuine Bayesian updating takes place (Glycopantis, Muir et al. 2003).

6.3.2 The utility functions

The patient's utility function is basically of the nature proposed by Köszegi (2003). It is a version of the PEU which is defined not only over physical outcomes but also over beliefs about future physical outcomes. It is assumed there are Periods 1, the present, and 2, the future. The game is played in Period 1 when the payoffs are also calculated. The patient needs to decide whether to follow the doctor's advice according to what he believes his health will be in period 2. His von Neumann-Morgenstern type utility function depends ultimately on his health state s, the

action he decides to take, and is conditional upon his attitude to information and takes the form:

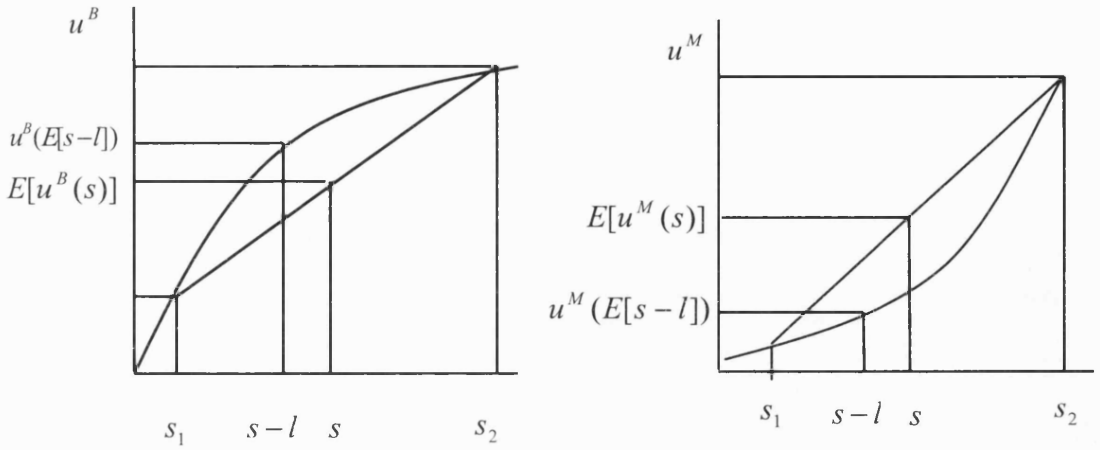
$$u(E[s-l \mid \text{patient's information preference}]). \quad (1)$$

There are two types of patient, monitors, i.e. information-loving, and blunters, i.e. information-averse ones. For monitors, the flow of high levels of information from the doctor to the patient lowers the anxiety level regarding future health, while it raises it for blunters.

We first consider the case of an information-averse patient. Similar to a risk-averse individual, who comparing utility to expected utility does not take a fair gamble (Kreps 1990) (Dassiou and Glycopantis 2007), an information averse patient prefers to know the expected state his health could be rather than knowing the probabilities with which he will be in a worse or better state. Or as Köszegi (2003) puts it he "dislikes bad news more than he likes good news". Consequently, the utility function for the information-averse patient is (strictly) concave (Figure 6.2 (a)).

Knowing his expected health $E[s]$ gives him greater utility, $u_B(E[s])$, than the utility he would get if he expects to be in state s_1 with probability p and in state s_2 with probability $1-p$, which reduces his utility to $E[u_B(s)]$. Concavity means that this holds for any s, s_1' and s_2', where $s \in [s_1', s_2'])$.

For the information-loving monitor, the picture is the reverse. He prefers to know the probabilities with which his state of health will be better or worse than knowing the expected state. His utility function is convex throughout (Figure 6.2 (b)). Knowing the probabilities with which he could be in states s_1 and s_2 gives him a utility of $E[u_M(s)]$ while knowing the expected state of health reduces his utility to $u_M(E[s])$. A (strictly) convex utility function implies that this holds for any s, s_1' and s_2', where $s \in [s_1', s_2']$.



(a) (b)

Figure 6.2: Utility function for a blunter (a) and a monitor (b).

For the doctor's utility function we make two assumptions. First, her utility increases as the patient's health does, but she is information neutral to his prospects of health, i.e. her utility, u_D, is linear. Second, she takes into account the effort she needs to put in every time she transfers information, as well as the negative atmosphere, i.e. anger a, and the worry w that are created if she does not pass on the full information to a monitor. Effort, anger and worry are all measured in (dis)utility terms.

The calculation of the payoffs of the doctor and the patient is done by taking into account their preferences about information, the strategies chosen by both players, the effort expended and the probable anger and worry caused. Doctor and patient consider the effect of their own actions, taking into account the choice of their opponent, with a view of maximizing their individual utilities. Therefore, the games we present are non-cooperative.

We now consider the three models in more detail.

6.3.3 Model 1: The patient is a blunter

In this game of perfect information and perfect recall the doctor knows she is dealing with an information-averse patient. A blunter is a patient whose anxiety increases with more information about his possible state of health.

The extensive form of the game is illustrated through the tree in Figure 6.3. Although it is not necessary, it includes, for later comparisons, Nature, N, which has chosen at the beginning of the game the patient to be a blunter. The doctor, Player 1, moves first and the patient, Player 2, can find himself at a node where the doctor has played T, i.e. she has spent time and passed on all the information, or NT, i.e. she has withheld part of the information. The patient can then choose whether to play A (adhere), or NA (not adhere).

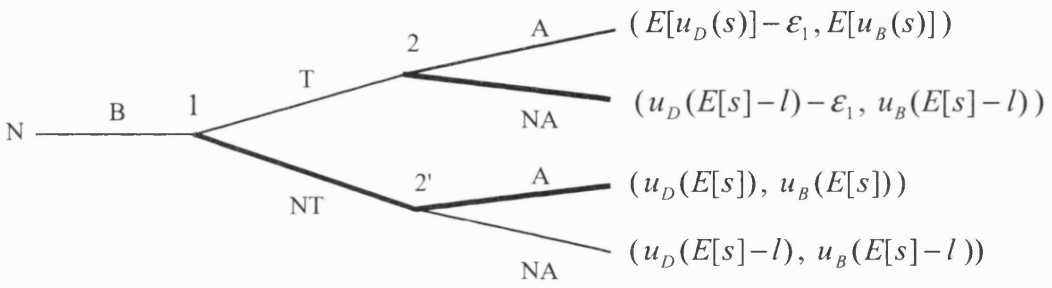


Figure 6.3: The doctor-patient game indicating the optimal path (Model 1).

The strategies of the doctor are therefore $\{NT, T\}$. The pure strategies of the patient are $\{(A, NA), (A, A), (NA, NA), (NA, A)\}$, where, for example, (A, NA) means that if he finds himself at node 2 he will play A and if at 2' he will play NA. Of course the players can also choose to mix their pure strategies.

The payoffs of each player depend on the strategies chosen by both players and are given by the vectors in the terminal nodes. The first element refers to Player 1 and the second is the payoff of Player 2.

If the doctor plays T, i.e. gives all the information to the patient, and the patient plays A, i.e. adheres, then the doctor has a payoff of $E[u_D(s)]-\varepsilon_1$, where ε_1 is the effort she puts in to supply the information. The patient's payoff is $E[u_B(s)]$. If the doctor plays T, but the player plays NA, i.e. he does not adhere, then the health outcome will be reduced by l given that the patient has not followed the doctor's recommendations. The payoffs for the doctor will be $u_D(E[s]-l)-\varepsilon_1$ and for the patient $u_B(E[s]-l)$.

If the doctor plays NT and the patient plays A they have payoffs $u_D(E[s])$ and $u_B(E[s])$. However, if the doctor plays NT and the patient plays NA then their payoffs are $u_D(E[s]-l)$ and $u_B(E[s]-l)$. That is both the patient and the doctor loose utility because the patient's health outcome is reduced as he has not followed the doctor's recommendations.

Backward induction is used to solve the game. The method requires starting from the end of the game and then working backwards, through the optimal decisions of the players, to the initial node. In our model it suffices to reach singleton 1 as Nature is not optimizing a payoff.

In the tree, the patient moves last having observed the action of the doctor. In the backward induction his decisions are considered first. Given that he is a blunter, if the doctor plays T, then he will play NA, i.e. he will decide not to follow her advice because $u_B(E[s-l]) > E[u_B(s)]$. On the other hand, if the doctor has played NT, i.e. she has not spent much time and has not given all the information, then the patient will decide to play A because $u_B(E[s]) > u_B(E[s]-l)$. Hence, the patient will adhere to the doctor's recommendations.

Following the optimal decisions of the patient, the tree folds up in the one presented in Figure 6.4. This now indicates the possibilities available to the doctor. Comparing her payoffs in the two alternative moves, she will decide to play NT and therefore not spend time with the patient.

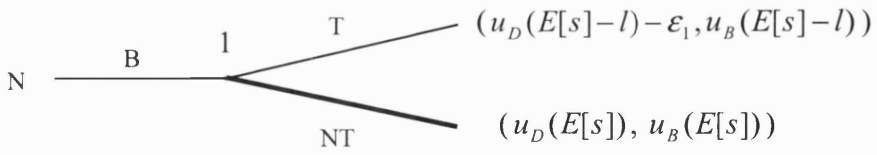


Figure 6.4: Backward induction (Model 1).

The first game theoretical solution concept available is that of Nash Equilibrium. It is defined here as a pair of strategies such that given the strategy of one player the other cannot change and do better. There are two pure strategies Nash equilibria in Model 1: $\{NT;(A, NA)\}$ and $\{NT; (A, A)\}$. Indeed, if the doctor plays NT the

patient cannot play any other strategy because that will result in him reducing his outcomes. Likewise, if the patient plays (A, NA) or (A, A) and the doctor changes his strategy from NT to NT she will only be worse off because $E[u_D(s)] - \varepsilon_1 < u_D(E[s])$.

The stronger solution concept of a subgame perfect equilibrium (SPE) is the outcome of the backward induction. It requires a Nash equilibrium at every subgame. It safeguards the patient against the possibility that the doctor chooses her action by mistake or without observing the rationality principle of optimal decisions. In this game the SPE $\{NT; (A, NA)\}$.

Model 1 shows that when the doctor knows with certainty that the patient prefers not to be aware in much detail about his condition and treatment, as this increases his anxiety, it is optimal for her not to spend much time and effort to provide all the information. This seems a quite obvious observation but will be crucial for the understanding of the general model discussed below. Also, the patient, having observed that the doctor has not given him a lot of information, decides that it is optimal for him to play strategy (A, NA). Therefore, the optimal path of the game is NT - A shown in Figure 6.3. In other words, the doctor will spend no effort and the patient will adhere. It is precisely the fact that the patient is information averse which implies that he will follow, on the optimal path, the doctor's instruction. He finds the fact that she has not spent much time and effort explaining the conditions of his health reassuring.

6.3.4 Model 2: The patient is a monitor

We now examine what happens when the patient has been chosen by nature to be a monitor, i.e. a person who likes information. Again, the structure and the payoffs of the game are common knowledge to the players.

The extensive form of the game is illustrated in Figure 6.5. As in Model 1, the doctor moves first by deciding whether to spend time with the patient (T) or not (NT). Armed with the privilege of knowing what the doctor has played, the patient then decides whether to adhere (A) or not (NA). As in Model 1, the pure strategies for the two players of the game are $\{NT, T\}$ for the doctor and $\{(A, NA), (A, A),$

(NA, NA), $(NA, A)\}$ for the patient, where for example (A, NA) means that if he finds himself at node 2 he will play a and if at 2' he will play NA. Of course the players can choose to mix their pure strategies. Again, the payoffs of each player depend on the strategies chosen by both players and are given by the vectors in the terminal nodes. The first element refers to Player 1 and the second to Player 2.

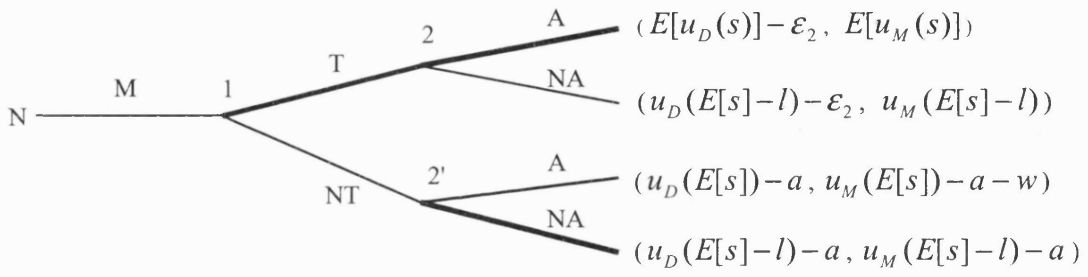


Figure 6.5: The doctor-patient game indicating the optimal path (Model 2).

If the doctor plays T, i.e. gives all the information to the patient, and the patient plays A, i.e. adheres, then the doctor has a payoff of $E[u_D(s)]-\varepsilon_2$, given that supplying all the information requires effort. The patient's payoff is $E[u_M(s)]$. If the doctor plays T, and the player plays NA, i.e. he does not adhere, then the health outcome will be reduced by l and the payoffs for the doctor will be $u_D(E[s]-l)-\varepsilon_2$ and for the patient $u_M(E[s]-l)$. That is both the doctor and the patient are worse off given that the patient has not followed the doctor's recommendations and as a consequence his health has been reduced.

If the doctor plays NT and the patient plays A, they have a payoff of $u_D(E[s])-a$ and $u_M(E[s])-a-w$ respectively. That is due to the fact that the anger created because the patient does not get all the information reduces the utility of both players. In addition the patient's worry reduces his payoff even further. On the other hand, if the doctor plays NT and the patient plays NA then their payoffs are $u_D(E[s]-l)-a$ and $u_M(E[s]-l)-a$ respectively.

Again, backward induction gives the solution to the game. In the tree the player moves last having observed the action of the doctor. In the backward induction his actions are considered first. Given he is a monitor (M), if the doctor plays T then he will play A, he will follow her advice because: $E[u_M(s)] > u_M(E[s]-l)$. On the

other hand, if the doctor has played NT then the patient will play NA, because $u_M(E[s]-l)-a > u_M(E[s])-a-w$. Hence the patient will non-adhere to the doctor's recommendations.

Following the optimal decisions of the patient, the tree in Figure 6.5 folds up in the one presented in Figure 6.6. This now indicates the possibilities available to the doctor. Since $E[u_D(s)]-\varepsilon_2 > u_D(E[s-l])-a$ the doctor will decide to play T.

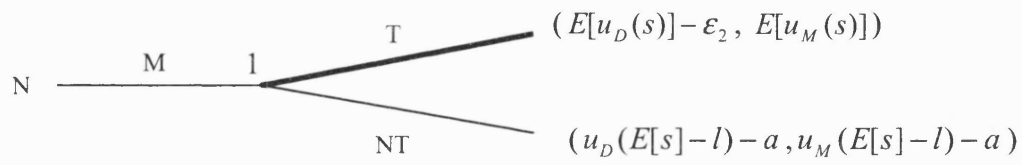


Figure 6.6: Backward induction (Model 2).

There are two pure strategies Nash equilibria for this game, $\{T;(A,NA)\}$ and $\{T;(A,A)\}$. Indeed, none of the players can change his/her strategies given the strategy that the other has chosen and do any better. The subgame perfect equilibrium is $\{T;(A,NA)\}$. This safeguards the patient against the possibility that the doctor is irrational or chooses her action by mistake.

Model 2 shows that when the doctor knows with certainty that the patient is an individual for whom more information reduces his anxiety, it is best for her to put effort into explaining in detail the prospects of his health. Again this appears to be an obvious conclusion. However, it will be crucial for the understanding of later model. Therefore, the optimal path of the game is T - A shown in Figure 6.5. In other words, the doctor will need to put effort in and the patient will adhere. It is precisely the fact that the patient is information loving which implies that he will follow, on the optimal path, the doctor's instruction. He finds the fact that she has spent so much time and effort explaining the conditions of his health reassuring.

6.3.5 Model 3: The doctor does not know the type of patient

We discuss here the third game, which is the most realistic representation of the doctor-patient interaction. In this model the doctor does not know with certainty the type of patient she is dealing with. The extensive-form of the game is presented through the tree in Figure 6.7.

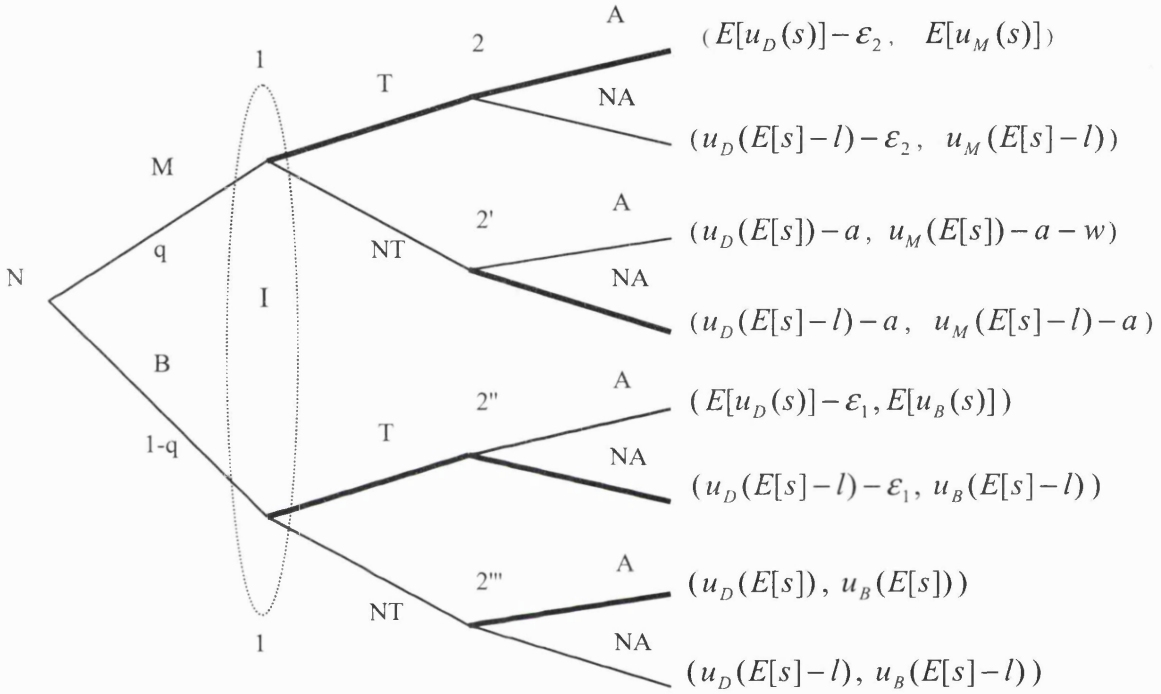


Figure 6.7: Extensive form of doctor-patient game indicating the optimal paths if doctor plays T (Model 3).

Nature (N) moves first, at time 0, and selects the type of patient. The doctor does not know the type of patient she is dealing with. This is represented in the game tree by the information set I shown by the dotted closed curve which contains the two nodes. If the doctor finds herself in I and wishes to play a pure strategy then it must be the same from both nodes. This is the significance of the information set I. The game described is of complete but imperfect information and perfect recall.

In order for the doctor to be able to take an action, and thus for the optimal paths to be calculated, she attaches a probability q that the patient is a monitor and a probability $1-q$ that he is a blunter. As will be shown below she can apply the principle of insufficient reason, an idea based on bounded rationality and apply an

equal probability to the two events or a more general distribution expressing his information and beliefs.

The doctor's pure strategies are $\{NT, T\}$. Each pure strategy is played from both nodes in information set I. The information sets of the patient are singleton. His pure strategies are: $\{(A, NA, NA, NA)$, (A, A, NA, NA), (A, NA, A, NA), (A, NA, NA, A), (A, A, A, A), (A, NA, A, A), (A, A, NA, A), (A, A, A, NA), (NA, A, A, A), (NA, NA, A, A), (NA, A, NA, A), (NA, A, A, NA), (NA, NA, NA, NA), (NA, A, NA, NA), (NA, NA, A, NA), $(NA, NA, NA, A)\}$, where for example (A, NA, NA, NA) means that the patient plays A from node 2 and 2''' and NA from nodes 2' and 2''.

As in the previous models, the payoffs of each player depend on the strategies chosen by both players and are given by the vectors at the terminal nodes, with the first element referring to Player 1 and the second to Player 2.

Of course, the information set I implies that the doctor has to take the same action from both nodes. However, going down a particular path from the initial node to a terminal one we have the same payoffs for the doctor and the patient as going down the corresponding path in Figure 6.3 if the patient is a blunter or Figure 6.5 if the patient is a monitor. Thus we obtain the payoffs and the terminal nodes of Figure 6.7.

Again, backward induction is used to obtain the optimal paths of the game. The patient knows exactly the path which has been followed up to a node when it is his turn to decide. In particular he knows whether he is a blunter and the choice of the doctor.

If the patient is a monitor (M) and the doctor has given him the information he wants, i.e. she has played T, then the patient will play A since $E[u_T^M(s) > u_T^M(E[s] - l)$ as shown in Figure 6.2 (b). So, in this case the patient will adhere. However, if the doctor plays NT, i.e. she does not pass on all the information, and the player is a monitor, then he will get angry and will express his anger in his payoff. This reduces both the utility of the patient and the doctor by a. In addition to this, the constant w is used to express the patient's worry if he

accepts the treatment while he knows that the doctor has not passed him all the information he wanted. This brings the patient's utility further down, in a way that it is assumed to imply: $u_N^M(E[s]-l)-a > u_N^M(E[s])-a-w$. In this case, therefore, the patient will play NA, i.e. he will not adhere to the doctor's recommendations.

Let us now consider the case of a blunter (B). If the doctor plays T then as shown in Figure 6.2(a) the patient will play NA, i.e. he will not adhere, because: $u_T^B(E[s]-l) > E[u_T^B(s)]$. On the other hand, if the doctor has played NT, i.e. she does not give all the information, then the patient will decide to play A because $u_N^B(E[s]) > u_N^B(E[s]-l)$.

Following the optimal decisions of the patient, the tree in Figure 6.7 folds up in the one in Figure 6.8. This shows the moves available for the doctor, along with the payoffs for every move for both the doctor and the patient.

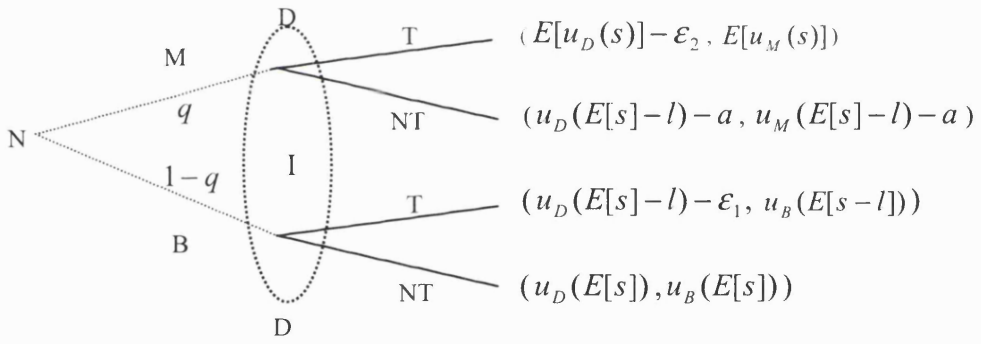


Figure 6.8: Backward induction (Model 3).

As stated above, the dotted closed curve shows that the doctor does not know whether she is under node following choice M or B. She will attach probabilities, expressing her beliefs, q that the patient is a monitor and $1-q$ that the patient is a blunter. Furthermore the fact that the doctor's utility is linear implies that $u_D(E[s]) = E[u_D(s)]$.

The solution of the game can be obtained by applying the principle of insufficient reasons (Luce and Raiffa 1957), which is based on the notion of bounded rationality (Simon 1957; Glycopantis and Muir 1994). As we shall see below the doctor can apply the principle of insufficient reason and give an equal probability to the two

events of Nature choosing either a monitor or blunter or a more general distribution expressing his information and beliefs (Glycopantis and Muir 1995). If there is really no sufficient reason to suppose that the patient is of either type one or the other type, the doctor will assign equal probabilities for the patient to be a monitor or a blunter. We shall also consider the implications of the doctor believing, probably on the basis of information collected, that the patient is more probably of a particular type.

We now examine for which q, let us call it q^*, the doctor is indifferent between playing T or NT. If the doctor plays NT her payoff will be:

$$U_1 = q \cdot [u_D(E[s]-l)-a]+(1-q)\cdot u_D(E[s]). \quad (2)$$

If the doctor decides to play T her payoff will be:

$$U_2 = q \cdot (E[u_D(s)]-\varepsilon_2)+(1-q)\cdot [u_D(E[s]-l)-\varepsilon_1]. \quad (3)$$

For the doctor to be indifferent between NT and T, payoffs of the two actions must be equal, or in other words: $U_1 = U_2$. Replacing U_1 and U_2 with their equivalent from (2) and (3) that is:

$$q \cdot [u_D(E[s]-l)-a]+(1-q)\cdot u_D(E[s]) = q \cdot (E[u_D(s)]-\varepsilon_2)+(1-q)\cdot [u_D(E[s]-l)-\varepsilon_1]. \quad (4)$$

The solution to the above equation, called q^* is given below[1]:

$$q^* = \frac{u_D(E[s])-u_D(E[s]-l)+\varepsilon_1}{2u_D(E[s])-2u_D(E[s]-l)+a+\varepsilon_1-\varepsilon_2}. \quad (5)$$

We bring equation (5) to a more manageable form:

$$q^* = \frac{u_D(E[s])-u_D(E[s]-l)+\varepsilon_1}{u_D(E[s])-u_D(E[s]-l)+\varepsilon_1+u_D(E[s])-u_D(E[s]-l)+a-\varepsilon_2} = \frac{X}{X+Y}. \quad (6)$$

where:

$X = u_D(E[s])-u_D(E[s]-l)+\varepsilon_1 > 0$ and

$Y = u_D(E[s])-u_D(E[s]-l)+a-\varepsilon_2 > 0$.

[1] Calculations are omitted for the purpose of clarity of the results. Detailed solution to the equation is given in Appendix C.1.

We now want to examine what the doctor will do under bounded rationality. As mentioned above, under bounded rationality the doctor does not hold any information regarding the patient's preferences, therefore adjusts equal probability to the patient being a monitor or a blunter. In mathematical terms, $q = \frac{1}{2}$.

Under bounded rationality, the doctor is indifferent between playing T or NT when $q^* = \frac{1}{2}$. Equivalently, we have:

$$\frac{X}{X+Y} = \frac{1}{2} \Leftrightarrow -\varepsilon_1 = -a + \varepsilon_2 \Leftrightarrow \varepsilon_1 + \varepsilon_2 = a. \quad (7)$$

We rewrite the above condition (7) in order to interpret the above conclusions:

$$\frac{1}{2} \cdot (\varepsilon_1 + \varepsilon_2) = \frac{1}{2} \cdot (0 + a). \quad (8)$$

For $q^* = \frac{1}{2}$ the left-hand side of the above equation (8) is the average disutility of effort if the doctor plays T and the right-hand side is her average disutility if she plays NT. When this holds, the doctor is indifferent between U_1 and U_2 and therefore she is indifferent on whether to play T or NT.

We now examine under which conditions the doctor will play T or NT. Under bounded rationality, in the case of insufficient reason, i.e. when $q = \frac{1}{2}$, the doctor will play NT if $U_1 > U_2$ which is equivalent to $\varepsilon_1 + \varepsilon_2 > a$.[2] This implies $q^* > \frac{1}{2}$. Following the interpretation used above, this means that the doctor will not pass on all the information to the patient if the average disutility of effort of providing the information is greater than her average disutility if she does not. The patient will then play A, i.e. will adhere, if he is a blunter or NA, i.e. will not adhere, if he is a monitor. This is an assessment equilibrium as it is defined not only in terms of what the players do but also in terms of what they believe.

[2] Calculations are omitted for the purpose of clarity of the results. Detailed solution to the equation is given in Appendix C.3.

On the other hand, under bounded rationality, the doctor will play T if $U_1 < U_2$ that is equivalent to $\varepsilon_1 + \varepsilon_2 < a$.[3] This implies $q^* < \frac{1}{2}$. This means that the doctor will pass on all the information to the patient if the average disutility of effort of doing so is lower than her average disutility if she does not. The patient will then play A, i.e. will adhere, if he is a monitor or NA, i.e. will not adhere, if he is a blunter. Again this is an assessment equilibrium.

To sum up, under bounded rationality, i.e. when the doctor attaches probability $\frac{1}{2}$ that the patient is a monitor or a blunter, the following three cases are possible:

- The doctor will be indifferent as whether to play T or NT when $\varepsilon_1 + \varepsilon_2 = a$,
- The doctor will play NT when $\varepsilon_1 + \varepsilon_2 > a$,
- The doctor will play T when $\varepsilon_1 + \varepsilon_2 < a$.

We note that given the beliefs of the doctor, the optimal paths can be considered as describing a Nash equilibrium, since nobody can improve his payoff given the strategies of the other. However, since decisions are taken under the doctor's beliefs concerning the nodes in I it is more appropriate to use the concept of assessment equilibrium which takes into account the initial beliefs of the doctor. We cannot really talk about a Perfect Bayesian Equilibrium because no updating of beliefs takes place based on Bayes rule.

For the case $q^* < \frac{1}{2}$ the optimal paths are shown in Figure 6.7 through the black lines from the nodes in the information set to two terminal nodes.

From the above conclusions we derive that as ε_1 and ε_2 go up, i.e. the effort the doctor needs to put in to pass on information increases, she will be willing to pay NT. On the other hand, when ε_1 and ε_2 decrease then the doctor will play T. However, when a increases, i.e. anger is created when the patient is a monitor and the doctor does not pass on all the information to him, then the former is willing to play T. However, when a decreases then the doctor will play NT.

[3] Again, calculations are omitted. Detailed solution to the equation is given in Appendix C.4.

These comparative statics results provide useful insights in understanding policy implications derived from the models. They will be discussed later in this chapter.

6.4 Limitations and directions for future research

This section discusses the limitations as well as possible extensions of the model presented above. The first point that should be made is that effort is rather a general concept that is used in the model as a way of demonstrating that the doctor cannot be expected to act as a perfect agent for the patient and maximise the patient's utility function. Apart from having her own utility function, she is often constrained by her strength and desire to serve a number of patients and by organisational factors. Effort has been used here as a proxy for a set of factors, and in future research their particular effect could be the object of analysis. For example, one could consider separately the effect of the length of time that can be allocated to a patient, the working hours of a doctor or the administrative support to screen the patient.

Model 3 presented a realistic situation in which the doctor cannot tell the type of patient she is examining. On the other hand, the patient knows exactly his type and the doctor's choice of action. An extension could be to analyse a model in which the patient will, of course, know his type but will not be able to tell with certainty what the doctor has played. In other words, in the extended model the patient will not be able to identify whether the doctor has told him the whole truth or not. For example, the length of consultation time will only be indicative but not decisive.

That would lead to a more involved game. It would create an extra two information sets with two nodes in each. Beliefs per type of patient would have to be attached to these nodes, pure strategies would be per information set, and there will be no subgames. The appropriate equilibrium concept would be that of perfect Bayesian equilibrium. The beliefs of the patient would be updated using Bayes rule. The analysis could reveal further aspects of the doctor-patient relationship.

An interesting point of conflict of interests of the two parties is the different way they value present and future outcomes. Doctors are more future-oriented and want to maximize the patient's health outcome in the future and are less interested in the

patient's anticipatory feelings in the present. Their goal is to improve the patient's health in the future rather than making a patient happier now.

On the other hand, the patients are more present oriented and they tend to discount the future. They put more weight on leading an easier life now rather than thinking of the consequences for their future health status. This is particularly true for life-style behaviours such as smoking. In order to model this conflict one could build again on Caplin and Leahy's Psychological Expected Utility theory (Caplin and Leahy 2001). There will be two periods 1, the present and 2, the future. The total utility is the sum of the utilities per period. The conflict of time-preferences could be modelled by allowing the doctor to put more weight on health outcomes in the future, while the patient would give a higher weight to the present.

We assumed in our models that every agent has one type of utility function that is concave, convex or linear. Of course, one could also consider more general utility functions such as a Friedman-Savage function to describe different attitudes to information concerning bad and good news. Our approach was designed to give an explanation of the features and findings of experimental studies.

The game theory model presented here was designed to capture the characteristic features and basic results of empirical findings. Certain results described in the model were major findings of the two empirical studies conducted for this thesis, both the European Social Survey and the survey conducted in the Centre for Hypertension in Athens.

For example, the questionnaire survey presented in Chapter 5 of the thesis found that patients who wanted more information and did not get it from the doctor were more likely to non-adhere to the prescribed medication. This is consistent with the results of the model. The analysis of the game showed that if the doctor has not passed on all the information then a patient who is a monitor will not adhere. A major predictor of non-adherence by a patient was if he felt that the doctor had not spent enough time with them.

Of course, more empirical testing of the models presented could be the object of future research. An ongoing effort to collect more data and information concerning the doctor-patient relationship could produce further findings which could be

analysed by an adjustment and adaptation of the present theoretical model analysed here. A suggestion for a possible further investigation is presented in Appendix C of the thesis. It presents the outline of a questionnaire survey and the type of information that needs to be collected to test the models.

6.5 Discussion and policy implications

The models developed here give concrete insights to the doctors and the policy makers into understanding first how patients' information preferences and beliefs affect their decisions and also how specific interventions may improve the doctor-patient relationship and help achieve adherence to recommendations. The policy implications derived from the models will be discussed with respect to the doctor, the patient and the health system. A more general discussion and policy implications are provided in Chapter 7, where both the empirical and theoretical findings are considered.

The models presented in this chapter capture the fact that patients vary in their preferences regarding how much information they need. Patients do not always want to know everything regarding their condition and future state (Morgan, Roufeil et al. 1998). Too much information increases the anxiety of blunters and, if provided, results in non-adherence to recommendations. On the other hand, information decreases the anxiety for the monitors and helps them adhere to what the doctor suggests.

Therefore, interventions aiming to educate patients and help them adhere to recommendations should be tailored to the patient's specific needs. Providing all the information will not always give desirable results and in fact may lead to different therapy decisions from those the physicians might hope for (Siminoff and Fetting 1991). Literature on tailored care has, indeed, shown that interventions focusing on the patient's individual needs increase satisfaction with care and improve adherence rates (Kreuter, Farrell et al. 2000). Leaflets and information material should be given to those who seek information but not necessarily to those who do not.

The models also provide interesting and specific results regarding the doctor's role and how it can be influenced to improve adherence. We consider financial

incentives first by assuming that doctors can be rewarded for their effort in supplying information to the patient. We start at $q^* = \frac{1}{2}$ in which the doctor is indifferent between playing T or NT. Financial incentives to award effort imply that ε_1 and ε_2 are reduced as part of them has been bought out through money reward.

Model 3 showed that as ε_1 and ε_2 decrease the doctor tends to play T, i.e. she will tend to pass on to the patient all the information. In other words, financial incentives that reward the doctor for her effort would have the result that she puts more effort into the consultation. This would increase adherence rates among monitors, i.e. information loving patients. However, if the patients are blunters this has the opposite effect. Therefore, the policy implication is that financial incentives of compensating the doctor for her effort are an effective method of improving adherence when patients are information loving.

It is interesting to see how doctors would behave under a different payment method system. Under Payment by Results schemes, doctors are paid not only on the basis of the number of patients they see but also by taking into account improvements they achieve in a patient's health outcomes. Assuming that adherence improves health outcomes it is interesting to see what the model predicts regarding the doctor's behaviour. In our model a constant P will be added to the payoff of the doctor when the patient plays A. The model implies that in expectations this payment itself will not directly change the decision of the doctor. Indirectly, though, it might reduce the disutility of the doctor from the effort resulting in a reduction of ε_1 and ε_2 in which case we get the same results as with financial incentives. In terms of policy implications the models do not seem to confirm a direct effect of a Payment by Results scheme in improving adherence. It can only have an indirect effect if it is seen as an alternative way of rewarding effort.

Model 3 also showed that the doctor's decision to put effort into the consultation also depends on a, i.e. the negative atmosphere created when a monitor realises that the doctor does not pass on all the information. The constant a can be perceived as the lack of trust developed during the consultation. If a decreases, i.e. an atmosphere of trust is created, the Model shows that the patient reaches the same

decision; however, the doctor can move from the indifferent point to the possible $\varepsilon_1 + \varepsilon_2 > a$. In this case the doctor will play NT. In other words, in situations in which the consultation is characterised by trust the doctor can put in less effort, i.e. spend less time with the patient. As the model shows this is to the benefit of the blunter.

Next, the doctor's training could show significant improvements in adherence rates. Doctors should be educated to understand patients' different needs and be better able to detect them. Knowing the type of patient she is diagnosing gives the doctor the privilege to be able to play a game of complete information. In this case the implication of our analysis is that the doctor passes on to the patient the right amount of information and therefore, as shown in Models 1 and 2, he will adhere to the recommendations.

Health system related interventions could also provide very helpful insights in terms of improving adherence. The models imply, as shown above, that if the doctor knows the patient's preferences then she plays the game with perfect information, therefore improves adherence rates. This is achieved from better trained administrative support to screen the patient before the consultation. The patient could be asked to complete a straightforward but appropriately designed questionnaire, while waiting to see their doctor, with the aim of the staff being able to identify information preferences.

For this purpose, a number of instruments have been validated and repeatedly been used to identify 'monitoring' and 'bluntering' preferences. The Miller Behavioral Style Scale (MBSS) is one of the most well known and frequently used instruments developed by Miller, who introduced the concept of 'monitors' and 'blunters' (Miller 1987). Completing this scale enables the doctors, especially when seeing patients for the first time, to have information regarding the type of patient they are about to meet and therefore pass on adequate information. Ideally, using the model's terminology, the completion of the questionnaire will enable the doctor to play the game as predicted by Model 1 or 2, depending on the type of patient.

This simple intervention will lead to a situation where the patient's needs for information are more likely to be understood by the doctor and that would increase

satisfaction with the consultation and also the patient's intention to follow recommendations. This is shown clearly by our models.

To sum up, a combination of institutional interventions and instruments to help the doctor and the patient, such as incentive schemes and tailored care, are appropriate for improving adherence rates among patients and this is predicted by our models.

6.6 Concluding remarks

The aim of this chapter has been to investigate whether a game theoretical approach that captures the patients' preferences for information about their health and doctor's possible inability, for various reasons, to understand these preferences may explain why patients fail to adhere to medical recommendations. The review of the literature identified a gap in this area as previous theoretical models failed to explain these conflicts in the doctor-patient relationship.

The game theoretical approach that was used here offers an interdependent decision analysis which explains the optimal decision for both players. In particular, it explains why the doctor may decide not to provide all the information to the patient and the patient may decide not to adhere to the recommendations.

More specifically, the chapter has presented an extensive form approach, expressed through game trees, that models the supply of information by a doctor to a patient when anxiety enters his utility function and she needs to put effort into supplying information. The models drew upon the Psychological Expected Utility introduced by Caplin and Leahy (2001).

The present models contribute to the literature in that the doctor takes into account not only the patient's utility but also the effort required, as a proxy of a number of constraints, to supply information. Also, in our models the patient is given an active role and can decide, based on his payoff function, whether to accept the recommendation or not. In the first two models, the doctor knows the type of patient. In Model 3, which is more realistic, the doctor does not know with certainty the type of patient and she acts under various hypotheses of bounded rationality to resolve the issue of uncertainty (Simon 1957).

The models were built under specific but reasonable assumptions and offer a complete resolution of the games, using comparative statistics analysis and giving economic interpretations. Their predictions are also reasonable. Models 1 and 2 show that when the doctor knows with certainty the type of patient she will transfer adequate information and the patient will adhere. In Model 3 the situation is more complicated. The doctor does not know the type of patient and needs to decide how much information to pass on. She has to consider not only the patient's utility but also the effort she needs to put into supplying the information.

Our analysis shows that, in deciding whether to fully inform the patient or not, the doctor will compare her average disutility of putting in effort with the average disutility of not doing so. The latter will stem from the anger of a monitor patient who realises that she is not being told the truth. This is an important marginal condition of the type that is encountered throughout economic theory.

Another result is that the patient will accept the doctor's recommendation if she has successfully supplied the information he wants regarding his state of health. A monitor will be satisfied with full information and a blunter with less detailed explanation of his health prospects.

Model 3 successfully predicts that consultations where the doctor does not recognise the patient's need and fails to pass on to the patient the right information may result in non-adhering to her recommendations. The analysis here is appropriate in situations where the patient visits the doctor for the first time to get diagnosis, and there is no prior information regarding the type of patient. This is often the case in acute care, where an urgent consultation is needed for a diagnosis and prescription. It can also refer to a first consultation for the treatment of a chronic condition. In this case the patient will at some point visit the doctor again possibly due to relapse or for continuing treatment.

It might then be possible for the doctor to deduce the patient's type from the effort that she previously put in and his subsequent state of his health. Our analysis covers this case as well. Either Model 1 or Model 2 will now be appropriate to be applied for the next consultations. This may partially explain why visits to the doctor for longer periods may improve adherence among patients.

In summary, a measure of success has been achieved in constructing models with realistic assumptions and reasonable predictions. A number of policy implications to increase adherence rates can be made. We have also pointed out the need for continuously updating the empirical evidence.

CHAPTER 7

GENERAL DISCUSSION AND POLICY IMPLICATIONS

7.1 Introduction

This chapter brings together the empirical and theoretical findings of the thesis and discusses them in a broader policy context. The two empirical studies give interesting results on the important issue of non-adherence to medication and the doctor-patient relationship in Greece, a country where no previous systematic evidence on the topic exists. The game theory approach explains a substantial part of the empirical findings of this thesis and previous empirical work. It also provides more general theoretical insights into the doctor-patient interaction with implications that are discussed beyond the Greek setting.

Non-adherence to medication is widely recognised as a problem of great significance and concern as it leads to reduced health outcomes and increased health care costs (WHO 2003). Researchers and policy makers acknowledge that the doctor-patient relationship plays an important role in patients' decisions to adhere to medical recommendations. Understanding this relationship will help with the design of appropriate policies to tackle the serious problem of non-adherence.

The rest of the chapter is organised in the following way. Section 7.2 considers first the empirical findings of the thesis in an attempt to understand the issue of the doctor-patient relationship and its impact on non-adherence and within the broader Greek setting. It then discusses how the non-cooperative game theory approach explains the conflicts of the doctor-patient interaction during the consultation in general and the findings of the empirical chapter more specifically. Section 7.3 discusses the policy implications of the findings. Section 7.4 gives directions for future research and Section 7.5 concludes the discussion.

7.2 General Discussion of Findings

The review of the literature indicated a clear recent tendency to depart from the misconception that non-adherence is primarily a patient-driven problem. Early attempts in the area were trying to identify the characteristics of the typical non-adherent patient, focusing on socioeconomic and demographic factors as well as disease and regimen related factors. During recent years researchers have been interested in a more in depth approach, by focusing on people's beliefs and emotions (Horne and Weinman 1999) and also investigating how the doctor can play a role in supporting these feelings (RPSGB 1997).

The thesis makes significant steps in this direction. Both of the empirical studies put great emphasis on understanding individuals' emotions and perceptions. The findings of both studies confirm the importance of these perceptions, in particular with respect to the doctor-patient relationship. They show that these perceptions were the strongest predictors of patients' decisions to adhere to the prescribed medication.

The theoretical chapter also acknowledges the importance of emotions in decision making and incorporates them into the utilities of both the doctor and the patient. Behavioural Economics provides invaluable help in achieving this and the models developed in our chapter are largely influenced by this upcoming field. By incorporating elements of Psychology, the models manage to describe the doctor-patient relationship in a more realistic way. The interaction of the decisions of the two parties explains why patients may fail to adhere to the doctors' recommendations.

7.2.1 Discussion of empirical findings and health prospects in Greece

On adherence

The analysis of the two empirical studies of the thesis indicated that individuals in Greece are distinctly adherent to the prescribed medications. The ESS study showed that the Greek sample was the second most adherent after the

Portuguese, with only 7% reporting they did not take their medication as prescribed. Similarly, the patient survey among the hypertensive patients in Athens demonstrated that the majority of the patients take their prescribed medication.

Adherence to medication is very important in improving health outcomes and managing chronic conditions (Trueman 2000). Of course, patients' engagement in their health care requires, apart from adherence to medication, an improved life style, smoking cessation, balanced diet and exercise. This is particularly true for conditions like hypertension, which was examined in this thesis, where a combination of medication taking, a low salt diet and moderate exercise is very important in achieving better outcomes (Izzo, Levy et al. 2000).

Despite the encouraging findings of the thesis that adherence rates to medication are high, there are other aspects of the public health profile of the population in Greece that require consideration. Smoking levels are particularly high. Greece has the highest frequency of smoking among European Union members with about 40% of the adult population being daily smokers (Vardavas and Kafatos 2007). In the specific case of the patients in Athens that were examined in Chapter 5, about 25% reported smoking every day or occasionally, despite being diagnosed with hypertension and other cardiovascular conditions.

Obesity is another major health issue in Greece. The problem is even more apparent among young children and adolescents, with about one out of three children in Greece being obese or overweight in 2000 (Obesity 2002). As the population departs from the traditional Mediterranean diet and exercises less, these trends have seen a dramatic increase over recent years (Kosti, Panagiotakos et al. 2007).

These changes in the lifestyle of the Greek population may also explain the deterioration of general indicators such as mortality and morbidity rates and the increasing burden of cerebrovascular and heart diseases and cancers of the trachea and lung (WHO 2007). Consequences of life-style choices in health outcomes are often only seen in the long-term. For example, it has been argued

that the impact of smoking on women's life-expectancy is not very apparent yet, as most women started smoking in the late 1970s (Davaki and Mossialos 2006).

The paradox of high life expectancy in Greece despite the low health care expenditure and GDP that puzzled researchers a few decades ago (Newhouse 1977) is very likely to disappear in the near future as it becomes evident that health outcomes deteriorate due to life-style choices. This indicates even more strongly the importance of an immediate and more holistic approach to improving health behaviours.

It is also worrying that the high adherence rates are not due to a clear health promotion and disease management programme that aims to tackle the issue. It was shown in this thesis that high adherence to medication among Greeks is based mainly on patients' relation with their doctors. This could be a potentially unstable situation as we discuss below.

Therefore, despite the encouraging findings that Greeks are following medications as prescribed by their doctors, there are still a number of life-style choices that need to be tackled. The observed high adherence rates to medication imply that there is every prospect that health promotion and disease management programmes based on a strong doctor-patient relationship could result in an improvement in this situation.

On the doctor-patient relationship

The most significant determinant of Greek respondents' decision to adhere was found to be their relationship with the doctors. The analysis of the ESS showed that they have a high opinion of their doctors, they respect their expertise and therefore trust them more than the rest of the Europeans do. Similarly, the survey among hypertensive patients in Greece confirmed trust in the doctor's expertise and this mainly explained patients' adherence to his recommendations.

The findings of both empirical studies indicate some seeds of paternalism in the doctor-patient relationship in Greece. However, this relationship could alter in

the future as the new generations of both doctors and patients are expected to be different in terms of expectations, facilities and knowledge.

An example of these changes is expected to be seen in the information channels used by the patients. The doctor was the dominant source of information regarding hypertension and the medication in the analysis of our questionnaire study. The use of other sources was very limited. In particular, the use of the Internet to get information regarding hypertension was reported by only 2.8% of the respondents and by an even lower 1.5% regarding anti-hypertensive medication. However, it has been widely reported in other empirical studies, concerning other countries, that the Internet is a popular source of information among patients, affecting their decisions to adhere to medication (Horne, Weinman et al. 2005).

In view of the evidence that the use of the Internet in Greece is increasing exponentially (OECD 2007), it is necessary to consider the possible implications. There is an ongoing debate on the influence that the Internet has on the doctor-patient relationship and we need to discuss both sides of the argument.

On the one hand, the use of online sources to get medical information can put the doctor-patient relationship in danger as it may challenge the doctor's expertise and make patients lose trust in the doctor. Evidence from a qualitative study of households in the UK who used the Internet to get health information shows interesting results on how it affected their health beliefs and behaviours (Hardey 2001). It demonstrated that it is the users of Internet information rather than medical authors or professional experts who decided what is accessed and how it is used. The study concludes that "the Internet forms the site of a new struggle over expertise in health that will transform the relationship between the health professions and their clients".

On the other hand, other studies show that information seeking on the Internet does not indicate a desire to disrupt the existing balance of power, or roles, in the consultation. A survey by Stevenson et al (2007) in the UK demonstrates that patients "appear to see the Internet as an additional resource to support existing and valued relationships with their doctors". The authors conclude that the

doctors therefore need not feel challenged or threatened when patients bring health information from the Internet to a consultation. They should see it as an attempt on the part of the patient to work with the doctor and respond positively.

There are consequently challenges coming up that may put pressure on the doctor-patient relationship in Greece. However, it is in the hands of health care providers to ensure these changes work for the benefit of both the doctor and the patient. The new generation of young doctors, a large number of whom have received training abroad, may be likely to understand the Internet more as an opportunity than a challenge. In discussion with their patients, doctors can identify users of the Internet and find ways in which this can be useful for their relationship. For example, doctors can be open in clarifying questions through emails between appointments in order to avoid having patients searching online for this information.

Another important issue that concerns our thesis regarding the doctor-patient relationship is doctors' incentives. There is no clear evidence on the impact that different types of incentives have on patient non-adherence to medication. The evidence is indirect and comes from the literature on the impact of incentives on clinical outcomes. Still studies that focus on these aspects are limited. More evidence is required to associate doctors' incentives with adherence to medication.

In Greece, as was discussed in Chapter 2, the system does not provide incentives to the doctors to improve the quality of health care (Davaki and Mossialos 2006). However, there may be less obvious, and difficult to identify, reasons for the doctors to prescribe, and ensure that the patients follow, the prescriptions. These may include informal payments and pressure from pharmaceutical companies that force doctors to prescribe more and ensure patient satisfaction, and consequently adherence to medication. More evidence is needed in this direction.

On institutional factors

Analysis of the European sample demonstrated interesting results regarding the impact of the institutional factors on non-adherence. Evidence on this area is limited and our results offer useful insights. More specifically, the thesis showed that individuals who feel they have enough choice in selecting their doctor were less likely to non-adhere.

A possible explanation of the impact of more choice on adherence could be that when people feel they have control of their actions, they are more determined to fulfil their health goal and, therefore, they may adhere better to the recommendations. Perception of control is an important element in theoretical models explaining health behaviour, including the Theory of Reasoned Action and Planned Behaviour as well as the Self-Efficacy model described in section 2.3.1.

On the other hand, choice of physician may be associated with better satisfaction with the consultation and the doctor, as was shown in a cross-sectional study by Schmittdiel et al. (1997) in the USA. The authors argue that the opportunity to select one's personal physician influences satisfaction with consultation and the health care provider. Satisfaction consequently has been shown to affect adherence to medication. Therefore, more choice may lead to more satisfaction with physicians and consequently satisfaction may improve adherence to recommendations.

The analysis also showed that those individuals who prefer to see the same doctor for different health problems were also less likely to non-adhere to the prescribed medication. A possible explanation may be that when patients see the same doctor they develop more personalised relationship, they trust him more and therefore, are more likely to follow his recommendations.

7.2.2 Theoretical insights

The thesis, apart from its empirical findings, contributes significantly to the theoretical discussion on the doctor-patient relationship. Chapter 6 used a non-cooperative game theory approach, in the form of a game tree, to capture the conflicts of the doctor-patient relationship and examine if this can explain patients' behaviour. It is influenced by the upcoming field of Behavioural Economics, which offers useful tools incorporating psychological factors into the utilities of both parties. In particular, it extends previous behavioural economics models based on the Psychological Expected Utility (PEU) by challenging the assumption of perfect agency relationship that models have employed.

The models developed yield interesting results. When the doctor knows the type of patient she is diagnosing she will pass on the right information and the patient will adhere to her recommendations. On the other hand, if the doctor is not certain about the type of patient then she may pass on the wrong information and this will result in non-adherence.

This agrees with previous empirical evidence. Studies on patients' preferences show that they vary with respect to how much information they want (Elkin, Kim et al. 2007). However, doctors often fail to understand patients' preferences and needs for information and participation in the decision making process (Bruera, Willey et al. 2002). When the agendas of the two parties are not met, satisfaction with the consultation encounter is low and this results in patients not adhering to the medication (Britten, Stevenson et al. 2000).

The models also agree with the empirical findings of the thesis. The analysis of the questionnaire survey among the group of hypertensive patients in Greece showed that those individuals who wanted more information and did not have it were more likely to non-adhere.

The game theoretical approach gives interesting insights into the doctor-patient relationship and its impact on non-adherence. Doctors who successfully detect the type of patients they diagnose meet their needs and this results in better adherence to medical recommendations.

All the above findings are discussed below within a broader policy context.

7.3 Policy Implications

As we discuss immediately below, the issue of non-adherence and its implications is of considerable importance. This highlights the need for urgent policy recommendations.

The impact of non-adherence in health care is very significant. WHO (2003) has reported that non-adherence to medication in long-term therapies, despite its variation by country and disease category, is a "worldwide" health problem of great magnitude. Adherence to medical recommendation is crucial in managing chronic conditions. The continuous ageing of the population and the consequent growing of the social and economic burden of chronic illnesses in developed countries urgently requires more attention to the problem of non-adherence.

Non-adherence to medication has also been shown to reduce health outcomes, due to relapses and rehospitalisation, and consequently leads to increased health care costs. In a study by Col et al. (1990), in the USA, non-adherence to recommendations accounted for 12% of the readmission of elderly people to hospitals due to relapses. Similarly, a meta-analysis by Sullivan et al. (1990) showed that 5.5% of hospital readmissions in the USA was due to non-adherence to recommendations.

The economic impact of non-adherence on health systems is also significant. The study by Sullivan et al. (1990) in the USA estimated the cost of readmissions to hospitals due to non-adherence to be 8.5 billion dollars on a national level. Therefore, improving adherence rates for chronic diseases through a number of effective policy interventions will have a positive return not only through primary prevention of risk factors but also avoidance of adverse health outcomes. As Haynes et al. (2002) point out "increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any other improvement in specific medical treatments".

No simple interventions have been shown to improve adherence. The Cochrane Review (2002) examined a number of interventions, proposed by different studies, intending to increase adherence rates. Two main conclusions are interesting. First, it pointed out that the number of studies that showed some improvement in adherence rates is still very small and more research of high quality is needed. Second, the successful interventions were very complex and required more than one method to achieve good results.

Based on the findings of both the empirical and theoretical investigations of the thesis we discuss a number of general policy recommendations to tackle the issue of non-adherence to medication. The interventions are given with respect to the doctor, the patient and the health system, and are discussed beyond the Greek setting. Given the constraints on funds available for the National Health Service as well as for other public sector requirements, the statements below do not necessarily imply a call for an increase in health expenditure but more of an efficient allocation of existing funds.

Non-adherence is not a patient-driven problem only

The first step to successfully tackle the issue of non-adherence is to think of the patient as an individual who needs to be supported by the health care provider and the system, rather than be blamed for his decision to non-adhere. The health care environment in which patients receive care is an important factor that affects non-adherence.

The findings of the thesis confirmed that the patient's decision was highly influenced by the doctor-patient relationship. The perceptions individuals hold regarding their doctors were the strongest determinants of their decision to adhere to prescribed medication. That was the result of both the analysis of the European Social Survey and the survey among hypertensive patients in Athens. Satisfaction with consultation, participation in the decision making process, and treating patients as equals were some of the aspects of the doctor-patient relationship that were shown to affect the decision to adhere to the prescribed medication.

The analysis of the ESS population sample showed that, apart from the doctor-patient relationship, other institutional factors were also associated with the individuals' decision to take the prescribed medication. More specifically, those individuals who felt they had enough choice in selecting their doctor and those who said they preferred the same doctor for different conditions were more likely to adhere to the medication. More choice of physicians or preference for the same doctor may be associated with higher satisfaction with the physician, which consequently affects adherence rates. Evidence on the impact of the system-related factors is limited and this thesis indicates the importance of it on non-adherence.

On the other hand, the empirical studies of the thesis do not support the hypothesis that demographic and socioeconomic factors consistently predict non-adherence. This is in agreement with the findings of the literature review (Lin, Von Korff et al. 1995; Brus, van de Laar et al. 1999) indicating that non-adherent patients should not be looked for within specific socioeconomic and demographic groups.

Similarly, the results did not confirm the idea that clinical characteristics were significant predictors of adherence among the hypertensive patients in Greece. Evidence in this area is contradictory, but it has been shown that the severity of the condition is not necessarily associated with adherence to the medical recommendations (Mann, Eliasson et al. 1992; Lin, Von Korff et al. 1995).

The WHO report on non-adherence (2003) urgently calls for more research emphasis to be given to the environment within which the issue of non-adherence is seen. This includes both the relationship with the health care provider as well as the health system. It argues that "patients need to be supported, not blamed".

The above findings and suggestions have concrete policy implications. They require more research funds to establish the exact conditions under which the doctor-patient relationship unfolds. Policies that consider issues of choice of doctors should take into account that when people feel they have more options in choosing their practitioner they are more likely to be adherent to the prescribed recommendations.

Similarly, people who prefer to see different doctors for different conditions were shown to be more adherent. This finding is in favour of the gate-keeping systems, where the GP or the family doctor can give advice on a number of different conditions.

Doctors' incentives: financial incentives do not always improve adherence

Empirical evidence on the impact that financial incentives to doctors have on health outcomes in general and non-adherence to medication more specifically is limited. A study by Chaix-Couturier et al. (2000) reviewing the related literature shows that financial incentives clearly affect doctors' behaviour in many ways; they may help reduce the use of health care resources, improve compliance with guidelines and achieve health targets. However, they suggest that they may be better used in combination with other incentives in order to be more effective and they do not show how they affect patients' adherence to medical recommendations.

The findings of this thesis show that financial incentives do not necessarily lead to better adherence rates. This was confirmed both empirically and theoretically. In particular, the empirical findings showed that in Greece, a country where the health system does not provide financial incentives to doctors to improve quality of care, adherence rates were very high. This was shown both from the analysis of the ESS and the questionnaire survey among hypertensive patients in Athens.

Our game theory model supports these results. As was more extensively discussed in Chapter 6, financial incentives, according to our models, are effective in improving adherence rates when patients are information-loving, yet they may not have similarly desirable results if patients are information-averse. A possible explanation could be that, as Chaix-Couturier et al. (2000) argue, motivating doctors with financial rewards increases the conflict of interests between the doctors and the patients, putting their relationship in danger.

The payment-by-results scheme, another type of financial incentive awarded to doctors when reaching certain targets, was also considered in the game theory

chapter. Our models showed that the scheme does not necessarily improve adherence rates. An interesting case on this type of incentive is the implementation of the Quality and Outcomes Framework (QOF) in the UK.[1] The scheme was introduced in 2004 and it is, therefore, too early to investigate its impact on doctors' behaviour and most importantly on patients' health outcomes. However, a recent study by Campbell et al. (2007) gives some interesting preliminary results, using data from primary care in the UK before and after the implementation of the QOF. The study did not look at the direct effect that the scheme may have on patients' decision to adhere but it found no strong evidence on the impact of the programme on clinical indicators. Therefore, no concrete policy implication can be deduced as yet from the payment-by-results scheme.

An overall conclusion from the above is that is that it must first be established what type of patients the doctors are treating before an improvement in adherence rates is expected through financial incentives to the doctors.

More comprehensive disease management programmes are needed

The increasing burden of chronic disease has forced policy makers to explore ways in which patients will be engaged in a programme that improves their health. However, one-sided interventions are neither useful nor cost-effective. A more comprehensive disease management approach is needed.

In Greece in particular, the findings of the thesis confirm this necessity. Results are encouraging as far as adherence to medication is concerned, but more can be done to secure better public health. Issues of obesity and smoking are deteriorating, causing fears for future consequences in health outcomes.

In view of the deterioration of health indicators in Greece, a great part of which is due to life-style choices and habits, there is an immediate need for public health programmes to tackle these serious issues. The programmes that aim to engage

[1] The Quality and Outcomes Framework (QOF) was implemented in April 2004 as part of the new contracts for primary care services (GMS contracts) in the UK. It is an annual reward programme that awards achievement points for clinical and organizational indicators as well as patient experience and additional services (such as contraceptive services and child health). Its aim is to incentivise the delivery of quality care. (Deparment of Health 2004).

people in healthier lifestyles can benefit from the good relationship that the Greeks currently have with their health care providers. The role of the doctor in Greece is vital in ensuring that the patients not only adhere to the prescribed medication but that they also change their behaviour by adopting healthier life-styles.

Tailored care

The literature has extensively demonstrated that patients vary with respect to how much information they want (Elkin, Kim et al. 2007) and how involved they wish to be in the decision making process. It is now accepted that the degree of information seeking and involvement differs among patients.

The game theory model presented in Chapter 6 supports the argument that tailored care can improve adherence rates. When the doctor understands the specific needs and preferences of the patient regarding information and adjusts her recommendations better adherence rates are achieved. On the other hand, if she fails to pass on the required information, then the patient will not adhere. This latter finding was confirmed by the empirical study among the hypertensive patients in Athens.

Previous empirical evidence confirms the effectiveness of tailored care in patients' decision to adhere. A study by Ownby (2005) in the USA finds that "individually tailoring information provided to patients has a greater impact on patient behaviour than providing generic information". His study develops an interactive software application to enhance the tailored supply of information and pilot data show higher degrees of acceptability among users and an association with highly sustained levels of adherence.

The policy recommendation that follows is that health care should be tailored to the specific needs of the patient. Supplying a lot of information, both verbally and through leaflets and booklets, will be beneficial for information-loving patients but may bring unwanted results to those averse to it.

Administrative support

To enhance tailored care, administrative support can be used to help doctors. There are a number of validated tools that enable doctors to detect patients' needs and preferences. More specifically, Miller (1987) has developed the Miller Behavioural Style Scale (MBSS) to identify information preferences. This simple and straightforward questionnaire helps the doctors identify the type of patient they are diagnosing and therefore pass on the appropriate amount of information.

Evidence on the association of information and non-adherence is not consistently confirmed. More information, although important, does not necessarily improve adherence rates (Horne, Weinman et al. 2005). A reasonable explanation is that patients do not always want to know all about their health as this may increase their anxiety about future outcomes (Elkin, Kim et al. 2007).

Our game theoretical model showed that when doctors treat their patients according to their needs better adherence rates are achieved. More administrative support should be directed toward enabling the doctor to identify the type of patient in order to meet their needs.

Health care professionals need to be trained to facilitate adherence

It has been shown clearly from both the empirical and theoretical findings of the thesis that the doctor has a significant role to play in supporting patients to improve adherence rates, yet health professionals do not get enough training on the issue and there is extensive literature arguing that doctors very often fail to identify non-adherent behaviours (DiMatteo and DiNicola 1982). This may be due to the fact that it was not until more recently that the importance of the doctor's role in the patient's decision was acknowledged.

In order to improve adherence, doctors need to receive more information on the issue. Medical training should educate doctors to understand the factors that affect non-adherence and possible ways and tools that can be used to identify them. The WHO (2003) argues that it is possible for health care providers to

learn to assess the potential for non-adherence and predict it accurately. Further training is needed for doctors to become more aware of the issue and to ensure patients take their medication as prescribed, and this is a clear policy implication.

Multidisciplinary approach

There is also an implication of the analysis concerning research in the area which should be supported through funds allocated in this direction.

The doctor-patient relationship is a very complex one. To understand how the two parties behave requires a multidisciplinary approach. Traditional Economics sets a solid technical foundation in modelling this interaction and has been useful in explaining decisions. However, it often uses strong assumptions for developing these models and fails to capture individuals' emotions and beliefs.

Behavioural Economics, combining Economics and Psychology, opens new ground in understanding human behaviour and decisions. Our game theory approach employs the PEU theory by Caplin and Leahy (2001), which allows utility to be based not only on health outcomes but also on beliefs about these outcomes. As Frank (2004) suggests, Behavioural Economics has concepts and analytical tools that fit well with the institutions of the health sector and Health Economics can benefit widely from their application. Concepts such as anxiety, included in the PEU theory used here, as well as trust, fear and regret are ideas that health economists have until now felt uncomfortable with.

These concepts are essential in understanding not only the doctor-patient interaction but also a wide range of health care issues. Therefore they would help health economists enormously in understanding complicated issues that traditional models cannot analyse fully. In the past, some attempts have been made to use psychological elements in health economic models and Behavioural Economics has touched upon issues such as physicians' behaviour, health care demand and insurance, the failure of Medicare in the USA etc. However, the contributions of Behavioural Economics in Health Economics and Policy have been very limited. Working together, psychologists and economists can provide

very useful insights into many aspects of health care. The non-cooperative game theory in this thesis, with the specific assumptions made, proceeds in this direction.

7.4 Further research

This thesis is part of the cumulative knowledge in the area. Its aim was to shed light on the doctor-patient relationship and the impact it has on patients' decision to adhere to medical recommendations. It identified a number of interesting points with respect to non-adherence to medication and the doctor-patient relationship in Greece, a country where no previous evidence really exists. The complexity of the doctor-patient interaction requires constant research and investigation of the theoretical elements which explain it and continuous collection of relevant empirical evidence.

The analysis of the ESS put the issue of adherence in the country context and gave interesting results regarding not only the impact of doctors but also that of the health system in general. The availability of more large-scale datasets would enable researchers in the future to investigate on a population level the impact of the doctor-patient interaction on non-adherence.

From a methodological viewpoint a few more future directions are proposed. Existing theoretical models that describe the doctor-patient relationship are quite limited in explaining the conflicts that occur during the consultation. On the other hand, our game theoretic models aim to capture these conflicts and understand both doctors' and patients' decisions. Our general Model 3 could be further extended by also not permitting the patient to know what the doctor has played, i.e. whether she has given all the information or not. This would increase the degree of ignorance in our model and would result in a more involved game in which both parties have information sets with more than one node. This could be a direction for obtaining further interesting, but more complicated, results from the conflicts that occur in the consultation.

The theoretical models presented in this thesis used the PEU theory to allow patients' emotions to enter the utility function. Human behaviours are not always based on actual outcomes but also on what people believe about them. Our models included emotions in the doctor's utility as well, but they mainly focused on understanding patients' behaviour. Further emphasis could be put on understanding, more in depth, the emotions that affect the doctor's utility as well. The field of Behavioural Economics is promising in that it provides very helpful tools to relax some of the strict technical economic assumptions, such as extreme rationality, by introducing elements of Psychology.

7.5 Conclusions

Non-adherence to medication is a worldwide health problem that needs serious consideration by health policy makers and health care providers. Following recommendations is of vital importance, especially in long-term therapies. Non-adherence decreases the effectiveness of the medication and increases the probability of relapses and unplanned hospitalisation. This results in increased health care costs that could be avoided if patients adhered to medical recommendations. This indicates the importance of more action to tackle non-adherence to medical advice and highlights the need for strong policy recommendations.

The thesis has confirmed, both at the empirical and the theoretical level, the importance of the doctor-patient relationship on patients' decisions to follow recommendations. The population survey showed that, irrespective of any disease characteristics and consultation settings, the way patients perceive their relationship with their health care providers affects their decision to adhere to prescribed medication. This was clear both when the collected Greek data was considered but also, and even more strongly, confirmed in the European sample.

Analysis of the ESS showed that the Greek population thinks highly of their doctors and this partly explains why they are adhering to their recommendations. Similar results were shown in the questionnaire survey we conducted for the purpose of this thesis among hypertensive patients in Athens. The game

theoretical model captured the conflict in the doctor-patient interaction. It was based on the assumption that doctors have their own utility functions and patients differ in their preferences regarding information. Doctors who fail to identify these preferences do not pass on the right information.

There are no gold-standard solutions to tackle non-adherence to medication. Interventions that have been shown to be effective use a combination of approaches. Non-adherence is a multidimensional problem and, as such, a more interdisciplinary approach is needed first, to understand, and then, tackle it.

More emphasis needs to be given to the doctors' role in improving adherence. The doctor-patient relationship lies at the heart of medical practice and improving it increases patients' satisfaction and results in better adherence. More than financial incentives, health care providers need to be trained to be able to detect non-adherent patients and make sure they follow their recommendations. Administrative support can enhance doctors' ability to identify patients' preferences and needs through simple interventions, like, for example, a simple questionnaire given to the patients before seeing the doctor.

The health system was also shown to impact on adherence. Patients who feel they have enough choice and prefer the same doctor for different conditions are more likely to adhere to medical recommendations. Governments need to take this into consideration when planning reforms.

Policy makers and researchers need to pay more attention to the importance of the issue of non-adherence, not only to medication but also to other health behaviours, and focus on the impact that the doctor has on it.

CHAPTER 8

CONCLUSIONS

This thesis looked at the issue of non-adherence to medication and the impact that the doctor-patient relationship has on patients' decisions to follow recommendations. First it investigated the issue at a population level, looking at how the general perceptions that people in Greece and in Europe have about doctors influence their decision to adhere to prescribed medication. It then focused on a particular group of hypertensive patients in Greece to see how the specific relationship that they have with their doctor affects their decision to adhere to medication. Then it developed a game theory approach to explain how conflicts that occur during the consultation may lead the patient to depart from the doctor's recommendations. Finally, it discussed the findings in the broader policy context. The purpose of this last chapter is briefly to summarise the thesis and wrap up our findings.

The impact of non-adherence to medication on health care is very significant, in particular among chronic conditions. It reduces health outcomes since patients who are not taking the medication as prescribed are more likely to relapses and deteriorate. This consequently leads to increased health care expenditure as relapses require more intense health care and possible rehospitalisation. In the light of the burden of chronic diseases continuously growing, and the constant pressure put upon health systems to reduce health care costs the necessity to tackle non-adherence is very apparent. It is therefore no surprise that the WHO (2003) described non-adherence in chronic illnesses as "a worldwide problem of striking magnitude". However, studies that look at the impact of the doctor-patient relationship on non-adherence to medication are limited in scope and number. This thesis helps in this direction by exploring how which aspects of the doctor-patient relationship are important in determining patients' decision to follow recommendations.

Chapter 2 reviewed the empirical studies that have been conducted in the area of non-adherence to identify determinants of patients' decision to depart from the doctor's recommendations. It was shown that the way the patients experience or

perceive their relationship with their doctors affects their decision on whether to adhere to recommendations. From the point of view of the general population, the empirical studies revealed that there is a lack of conclusive evidence on the issue of non-adherence and the related doctor-patient relationship. The majority of the studies are conducted in specific disease groups and settings. Little is known about how people perceive their doctors in general and how this impacts on their decision to follow recommendations when given. Also, evidence from the empirical studies showed that the doctor-patient relationship is rather complex and is often characterised by conflicts. Differences in the patient's needs and doctors' failure to understand them may lead to unsatisfactory results such as non-adherence to medication.

Chapter 2 also reviewed the theories used to explain non-adherence, including the Health Belief Model, the Theory of Reasoned Action and Planned Behaviour, the Self-efficacy Model and the Stages of Change Model. Further, it reviewed the main models used to describe the doctor-patient relationship and how they explain non-adherence. Four models were reviewed: paternalism, shared decision making, informed decision making and, from the field of Health Economics, the agency theory. By reviewing the theories interesting elements were shown to provide valuable insights for the thesis. However, another gap was identified; that is that the current models fail to capture the conflicts that the empirical evidence largely demonstrates that are present during the consultation. This indicated the need for a better theoretical understanding of the issue.

Elements from the empirical studies as well as seeds of the theories on non-adherence and the doctor-patient relationship were the basis of our investigation in this thesis. The chapter closed with a general but brief description of the Greek health system, given the focus of the empirical studies of the thesis.

Having identified the limitations of the literature, Chapter 3 presented the conceptual framework of the thesis, stating the research hypotheses and questions. Three main hypotheses were developed. First, the country context within which the issue of non-adherence and doctor-patient relationship is examined plays an important role in its understanding. Second, the views that a specific group of patients holds regarding

their doctor affects their decision to non-adhere. Finally, patients' preferences for information differ and the doctor's inability to understand them may explain the lack of adherence to medical recommendations. Two empirical studies and a theoretical framework were analysed to address the above hypotheses. The empirical studies concerned Greece, a country where no previous systematic evidence exists. The theoretical framework was a game theory model to explain, under conditions of conflict, the supply of information during the consultation and how it impacts on patients' decision to non-adhere.

Chapter 4 presented the first empirical study, which examined the issue of non-adherence and the doctor-patient relationship at the population level. For that purpose, data from the European Social Survey were used to examine how the general population thinks of their doctors and the impact this has on their decision to non-adhere to prescribed medication. The statistical procedure followed for the analysis of the data was that of a regression model in the form of Heckman probit with sample selection. Findings showed that the Greek population is very adherent. The perception that Greeks have about their doctors were the most important predictors of this behaviour. More specifically, discussion with the doctors on their treatment and the opportunity to ask questions and believing that illnesses cannot be cured without a doctor's advice were the main factors that impact on the patient's decision. The findings indicate that the way people perceive the doctor-patient relationship is crucial in their decision to follow prescribed recommendations.

Other variables shown to affect the patients' decision were institutional factors. Having greater choice and being able to see the same doctor for different conditions were both predictors of better adherence rates. On the other hand, demographic and socioeconomic factors did not have a systematically significant impact on patients' decision to adhere.

Chapter 5 presented the second empirical study of the thesis, which is a questionnaire survey among hypertensive patient in Greek. The study was conducted in the Centre for the Treatment of Hypertension in the Hippocration General Hospital in Athens. Seven hundred and forty-three patients were interviewed on their beliefs about their doctor and also their attitudes towards medication and

information preferences. A probit model was used to analyse the data. Results indicated that patients were very adherent to the medical recommendation. Their relationship with their doctor was the most important predictor of their decision to adhere. The study in Greece also revealed interesting results on patients' preferences regarding information. They feel more informed about their condition and less about the medication to treat it. Lack of information on medication was a significant determinant of non-adherence. The doctor was the main source of information for the patients. Patients did not seem to look around for information and the use of other sources, such as the Internet, was very limited.

Both empirical studies, although with different econometric and statistical techniques appropriate to the respective samples, agree on the fact that patients in Greece are very adherent. They also agree that they have a good relationship with their doctors and this was one of the main predictors of their decision to adhere to their recommendations.

Chapter 6 was the theoretical part of the thesis. Current theoretical models that have been used to describe the doctor-patient relationship have been useful in explaining certain aspects of the interaction and its impact on non-adherence. However, they are not adequate to explain the conflicts of the consultation that the review of the empirical evidence identified. The game theory approach is an extension of previous models from the field of Behavioural Economics. These models, based on the Psychological Expected Utility, include beliefs and emotions on patients' utility function and allow for patients to vary in their preferences regarding information on their health. They explain aspects of the doctor-patient interaction based on a perfect agency assumption.

The models developed in this thesis are constructed under reasonable assumptions based on the investigated empirical evidence. They relax the assumption of perfect agency on the basis of empirical findings. To capture this, they also introduce the notion of the doctor's effort in the supply of information. The model showed that the conflicts occurring during the consultation may lead to non-adherence. The models indicated that when the doctor can predict the type of patient she is diagnosing, she will pass on the right information and the patient will adhere. However, when the

doctor cannot tell with certainty the type of patient she may not pass on the right information, in which case the patient will not adhere. The predictions of our models are discussed within the policy context.

Chapter 7 summarised the findings of the thesis and discussed them in a broader policy context. The implications for policy have three dimensions, the doctor, the patient and the system. Patients need to be supported, not blamed. Both the empirical evidence and the theoretical model showed that the importance of the doctor's role in helping the patient adhere is crucial. Tailored care that is treating patients in accordance to their specific needs seems to work better. Not all patients may have the same needs and preferences. In addition, doctors need to be trained more to tackle non-adherence. Doctor's training should focus on understanding patient differences and treat them adequately. Improving certain aspects of the consultation, such as discussing more on the treatment with the patients, allowing time for them to ask questions and give enough information on the condition and mainly on the medication is very important in improving adherence. Financial incentives do not necessarily lead to better adherence outcomes, as was shown by both the empirical findings and the game theory model. Finally, the system can also help patients. Simple interventions, such as the completion of a quick questionnaire before the consultation to identify patients' preferences can have successful results. It was also shown that more choice and specialisation of doctors promotes better adherence.

To sum up, the thesis has shown, both empirically and theoretically, that the doctor-patient relationship plays an important role in the latter's decision to adhere to the prescribed recommendations. It is part of the cumulative knowledge in the area and could lead to further empirical and theoretical investigations.

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APPENDIXES

APPENDIX A

Table A1: Correlation matrix of BELIEF variables used (ESS)

	PPLCURE	PPRLYDC	PSMDCPR	DSPLVPR	DCKPTRT	DCTREQL	DCDISC	PTNRLCP	DCADMMS	DCDFCWR
PPLCURE	1									
PPRLYDC	0.1611	1								
PSMDCPR	0.0295	0.0481	1							
DSPLVPR	-0.0425	-0.0133	0.1665	1						
DCKPTRT	-0.0118	0.0077	0.037	0.0449	1					
DCTREQL	0.0541	-0.0022	-0.0249	-0.0692	-0.016	1				
DCDISC	0.0784	0.0135	-0.0016	-0.0612	-0.0059	0.3977*	1			
PTNRLCP	0.0099	0.0527	0.0033	0.0271	0.1249	-0.0707	-0.0251	1		
DCADMMS	-0.0094	-0.0005	0.0106	-0.0068	0.0278	0.1446	0.1473	0.0017*	1	
DCDFCWR	0.0043	0.0495	0.0439	0.0478	0.1266	-0.0927	-0.0525	0.2158	-0.0144	1

Table A2.1: Factor analysis for BELIEF variables (ESS)

	Eigenvalue	Difference	Proportion	Cumulative
Factor1	0.71471	0.32733	1.06	1.06
Factor2	0.38738	0.19631	0.5745	1.6345
Factor3	0.19107	0.0207	0.2834	1.9179
Factor4	0.17037	0.21474	0.2527	2.1705
Factor5	-0.04436	0.02871	-0.0658	2.1047
Factor6	-0.07308	0.06466	-0.1084	1.9964
Factor7	-0.13773	0.00274	-0.2043	1.7921
Factor8	-0.14047	0.02269	-0.2083	1.5838
Factor9	-0.16316	0.06728	-0.242	1.3418
Factor10	-0.23045		-0.3418	1

LR test: independent vs. saturated chi2(45)=1.4e+04

Prob_chi2<0.001

Table A2.2: Factor analysis for BELIEF variables with 4 factors

	Factor1	Factor2	Factor3	Factor4
PPLCURE	0.1029	0.1326	-0.2623	0.0998
PPRLYDC	0.0011	0.1776	-0.2456	0.1
PSMDCPR	-0.07	0.1455	0.083	0.2684
DSPLVPR	-0.1545	0.0978	0.1726	0.216
DCKPTRT	-0.0936	0.2499	0.0942	-0.068
DCTREQL	0.5314	0.0938	0.0507	-0.0061
DCDISC	0.5109	0.1583	0.0375	-0.0026
PTNRLCP	-0.1697	0.3148	-0.0033	-0.1359
DCADMMS	0.2221	0.1109	0.1107	-0.0119
DCDFCWR	-0.2125	0.3159	0.0127	-0.0921

Table A2.3: Factor analysis for BELIEF variables with 3 factors

	Factor 1	Factor 2	Factor 3	Uniqueness
PPLCURE	0.1029	0.1326	-0.2623	0.903
PPRLYDC	0.0011	0.1776	-0.2456	0.9081
PSMDCPR	-0.07	0.1455	0.083	0.967
DSPLVPR	-0.1545	0.0978	0.1726	0.9368
DCKPTRT	-0.0936	0.2499	0.0942	0.9199
DCTREQL	0.5314	0.0938	0.0507	0.7063
DCDISC	0.5109	0.1583	0.0375	0.7125
PTNRLCP	-0.1697	0.3148	-0.0033	0.8721
DCADMMS	0.2221	0.1109	0.1107	0.9261
DCDFCWR	-0.2125	0.3159	0.0127	0.8549

Table A2.4: Factor analysis for BELIEF variables with 2 factors

	Factor 1	Factor 2	Uniqueness
PPLCURE	0.1029	0.1326	0.9718
PPRLYDC	0.0011	0.1776	0.9684
PSMDCPR	-0.07	0.1455	0.9739
DSPLVPR	-0.1545	0.0978	0.9666
DCKPTRT	-0.0936	0.2499	0.9288
DCTREQL	0.5314	0.0938	0.7088
DCDISC	0.5109	0.1583	0.7139
PTNRLCP	-0.1697	0.3148	0.8721
DCADMMS	0.2221	0.1109	0.9384
DCDFCWR	-0.2125	0.3159	0.8551

Table A2.5: Factor analysis for BELIEF variables with 1 factor

	Factor 1	Uniqueness
PPLCURE	0.1029	0.9894
PPRLYDC	0.0011	1
PSMDCPR	-0.07	0.9951
DSPLVPR	-0.1545	0.9761
DCKPTRT	-0.0936	0.9912
DCTREQL	0.5314	0.7177
DCDISC	0.5109	0.739
PTNRLCP	-0.1697	0.9712
DCADMMS	0.2221	0.9507
DCDFCWR	-0.2125	0.9549

Table A3.1: Selection model for Model III / Greece

	coefficient	Stand. Error	z	p>|z|	95% C.I.	
Socio-demographic factors						
age (years)	0.0002	0.00016	1.36	0.173	-0.000097	0.00054
age squared (years)	-0.0124	0.0165	-0.76	0.45	-0.0449	0.01994
sex (0=male 1=female)	-0.2083	0.0942	-2.21	0.027	-0.3930	-0.0236
married (0=not married 1=married)	0.0551	0.1071	0.51	0.607	-0.1548	0.2651
education (0=primary education)						
Secondary	-0.0515	0.1329	-0.39	0.698	-0.312	0.2089
Tertiary	0.1463	0.1759	0.83	0.406	-0.198	0.4911
Urban	-0.251	0.1100	-2.28	0.023	-0.4668	-0.0352
feeling about household's income (0=living comfortable)						
coping at present income	-0.236	0.1725	-1.37	0.17	-0.5749	0.1016
difficult on present income	-0.1514	0.1817	-0.83	0.405	-0.5076	0.2048
very difficult on present income	-0.1236	0.2123	-0.58	0.56	-0.5399	0.2925
Health status						
health status (0=good)						
fair	0.3290	0.1623	2.03	0.043	0.0109	0.6472
bad	-0.1885	0.3431	-0.55	0.583	-0.8610	0.4839
disability (0=no. 1=yes)	0.4366	0.2322	1.88	0.06	-0.0185	0.8917
Health system						
choice regarding GP (0=not enough. 1=enough choice)	0.0039	0.1002	0.04	0.969	-0.1925	0.2004
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0919	0.0990	-0.93	0.354	-0.2861	0.1022
Worried of side effects (0=no & to some extent. 1=yes)	0.2404	0.1113	2.16	0.031	0.0221	0.4588
Doctor-patient relationship (believe...)						
... people can cure themselves *	-0.2100	0.1210	-1.74	0.083	-0.4473	0.0271
...people rely too much on doctors *	0.0372	0.0986	0.38	0.706	-0.1560	0.2304
...when people sure doctor should prescribe *	-0.0330	0.1143	-0.29	0.772	-0.2572	0.1910
... disappointed leaving without prescription *	-0.1509	0.1882	-0.8	0.423	-0.5198	0.2179
...doctors keep the whole truth **	-0.3306	0.1072	-3.08	0.002	-0.5408	-0.1203
....doctors treat patients as equals **	0.2106	0.1021	2.06	0.039	0.0104	0.4109
...doctors discuss before they decide **	0.1635	0.0987	1.66	0.098	-0.0299	0.3569
...patients are reluctant to ask questions **	0.0034	0.1249	0.03	0.978	-0.2413	0.2483
...doctors admit their mistakes **	0.0677	0.1735	0.39	0.696	-0.2723	0.4078
...doctors use words difficult to understand **	0.2533	0.1149	2.2	0.028	0.0279	0.4787
Interview time	-0.0119	0.0042	-2.82	0.005	-0.0202	-0.0036
constant	2.4457	0.5027	4.87	0.000	1.4604	3.4310
athrho	1.4367	0.6580	2.18	0.029	0.1469	2.7264
rho	0.8930	0.1332			0.14589	0.99146
Wald test of indep. Eqns. (rho=0): chi2(1)=4.77 Prob>chi2=0.0290						
* 0=not agree. 1=agree						
** 0=no & to some extent. 1=yes						

Table A3.2: Selection models for ESS-24

	Model I Marginal Effects	Model II Marginal Effects	Model III Marginal Effects
Socio-demographic factors			
age (years)	-0.000049	0.000011	0.000015
age squared (years)	0.0104**	-0.00027	-0.00085
sex (0=male 1=female)	-0.1617***	-0.0977***	-0.856**
married (0=not married 1=married)	0.0041	0.0308	0.0520
education (0=primary education)			
secondary	-0.0595	-0.1380	-0.1534
tertiary	-0.0528	-0.1528	-0.1613
urban	0.1056	0.08626	0.0498
feeling about household's income (0=living comfortable)			
coping at present income	-0.1062	-0.1015	-0.0678
difficult on present income	-0.4334*	-.3464***	-0.2816*
very difficult on present income	-0.5729***	-0.4694***	-0.4187***
Interview time	-0.0021	-0.0019*	-0.0021*
Health status			
health status (0=good)			
fair		-0.0206	-0.0144
bad		0.1626	0.0292
disability (0=no. 1=yes)		0.2414**	0.2739***
Health system			
choice regarding GP (0=not enough. 1=enough choice)		0.1748	0.1582
prefer same doctor (0=not same or indifferent. 1=same doctor)		0.2737***	0.2279***
Worried of side effects (0=no & to some extend. 1=yes)		0.1556**	0.0993
Doctor-patient relationship (I believe...)			
..people can cure themselves (0=not agree. 1=agree)			-0.0457
..people rely too much on doctors (0= not agree. 1=agree)			-0.0298
..if people sure of medicine doctor should prescribe(0=not agree. 1=agree)			0.0316
..feel disappointed when leave without prescription (0=not agree. 1=agree)			-0.0025
..doctors keep the whole truth (0=no. 1=yes)			-0.0483*
..doctors treat patients as equals (0=no. 1=yes)			0.0065
..doctors discuss treatment before they decide (0=no. 1=yes)			0.0949**
..patients are reluctant to ask questions (0=no. 1=yes)			-0.0299
..doctors admit their mistakes (0=no. 1=yes)			0.0511
..doctors use words patients find difficult to understand (0=no. 1=yes)			-0.0252
Log pseudolikelihood	-20813.14	-16989.44	-13361.01
athrho	1.1263145*	.90835712*	2.941546

*p<0.05; **p<0.01; ***p<0.001

Table A4.1: Interaction Effects (age*discuss with doctor)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	0.000031	0.0002	0.8510	-0.0003	0.0004
age squared (years)	-0.0186	0.0173	0.2830	-0.0524	0.0153
sex (0=male 1=female)	0.1900	0.1061	0.0730	-0.0179	0.3979
married (0=not married 1=married)	0.0781	0.1136	0.4920	-0.1445	0.3007
education (0=primary education)					
secondary	0.0406	0.1383	0.7690	-0.2305	0.3117
tertiary	-0.1541	0.2204	0.4840	-0.5861	0.2779
urban	-0.1910	0.1134	0.0920	-0.4133	0.0313
feeling about household's income (0=living comfortable)					
coping at present income	-0.0085	0.1840	0.9630	-0.3691	0.3521
difficult on present income	-0.0425	0.1864	0.8200	-0.4079	0.3230
very difficult on present income	0.0373	0.2098	0.8590	-0.3740	0.4486
Health status					
health status (0=good)					
fair	0.3450	0.1756	0.0490	0.0008	0.6893
bad	0.1965	0.3239	0.5440	-0.4384	0.8314
disability (0=no. 1=yes)	0.0125	0.1945	0.9490	-0.3687	0.3938
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1280	0.1098	0.2440	-0.3433	0.0872
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0561	0.1095	0.6090	-0.2707	0.1586
Worried of side effects (0=no & to some extend. 1=yes)	-0.1236	0.1116	0.2680	-0.3424	0.0952
Doctor-patient relationship					
believe people can cure themselves *	0.2386	0.1324	0.0710	-0.0209	0.4980
believe people rely too much on doctors *	0.0357	0.1055	0.7350	-0.1710	0.2425
believe when people sure of medicine doctor should prescribe *	0.2080	0.1207	0.0850	-0.0286	0.4446
feel disappointed when leave without prescription *	0.1996	0.1809	0.2700	-0.1550	0.5542
believe doctors keep the whole truth **	-0.1132	0.1284	0.3780	-0.3649	0.1385
believe doctors treat patients as equals **	0.1588	0.1125	0.1580	-0.0616	0.3792
believe doctors discuss treatment before they decide **	-0.1910	0.2957	0.5180	-0.7706	0.3886
believe patients are reluctant to ask questions **	0.2716	0.1246	0.0290	0.0273	0.5159
believe doctors admit their mistakes **	0.1132	0.1769	0.5220	-0.2335	0.4598
believe doctors use words patients find difficult to understand **	0.1465	0.1101	0.1830	-0.0693	0.3622
Interaction effect (age*discuss with doctor)	-0.0009	0.0059	0.8790	-0.0126	0.0108
constant	-1.0468	0.4946	0.0340	-2.0162	-0.0774
athrho	1.2108	0.5499	0.280	0.1330	2.2886
rho	0.8369	0.1647		0.1322	0.9796
Wald test of indep. Eqns. (rho=0): chi2(1)=4.85 Prob>chi2=0.0277					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.2: Interaction Effects (age*doctors treat patients as equals)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	0.000032	0.0002	0.8440	-0.0003	0.0004
age squared (years)	-0.0188	0.0166	0.2600	-0.0514	0.0139
sex (0=male 1=female)	0.1901	0.1055	0.0720	-0.0167	0.3970
married (0=not married 1=married)	0.0784	0.1141	0.4920	-0.1452	0.3019
education (0=primary education)					
secondary	0.0405	0.1379	0.7690	-0.2298	0.3107
tertiary	-0.1546	0.2203	0.4830	-0.5864	0.2772
urban	-0.1910	0.1137	0.0930	-0.4137	0.0318
feeling about household's income (0=living comfortable)					
coping at present income	-0.0055	0.1836	0.9760	-0.3653	0.3543
difficult on present income	-0.0390	0.1852	0.8330	-0.4019	0.3239
very difficult on present income	0.0414	0.2077	0.8420	-0.3657	0.4485
Health status					
health status (0=good)					
fair	0.3442	0.1748	0.0490	0.0015	0.6868
bad	0.1945	0.3223	0.5460	-0.4372	0.8263
disability (0=no. 1=yes)	0.0130	0.1943	0.9470	-0.3678	0.3938
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1299	0.1094	0.2350	-0.3444	0.0846
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0564	0.1096	0.6070	-0.2713	0.1585
Worried of side effects (0=no & to some extend. 1=yes)	-0.1248	0.1126	0.2680	-0.3456	0.0959
Doctor-patient relationship					
believe people can cure themselves *	0.2387	0.1323	0.0710	-0.0206	0.4981
believe people rely too much on doctors *	0.0345	0.1056	0.7440	-0.1724	0.2415
believe when people sure of medicine doctor should prescribe *	0.2079	0.1207	0.0850	-0.0287	0.4445
feel disappointed when leave without prescription *	0.1975	0.1801	0.2730	-0.1554	0.5504
believe doctors keep the whole truth **	-0.1140	0.1286	0.3750	-0.3660	0.1380
believe doctors treat patients as equals **	0.1980	0.2824	0.4830	-0.3554	0.7514
believe doctors discuss treatment before they decide **	-0.2352	0.1089	0.0310	-0.4486	-0.0219
believe patients are reluctant to ask questions **	0.2708	0.1248	0.0300	0.0262	0.5153
believe doctors admit their mistakes **	0.1140	0.1771	0.5200	-0.2332	0.4612
believe doctors use words patients find difficult to understand **	0.1470	0.1100	0.1810	-0.0686	0.3626
Interaction effect (age*doctors treat patients as equals)	-0.0009	0.0056	0.8770	-0.0119	0.0101
constant	-1.0398	0.4782	0.0300	-1.9771	-0.1026
athrho	1.4356	0.6864	0.0360	0.0903	2.7808
rho	0.8928	0.1393		0.0900	0.9923
Wald test of indep. Eqns. (rho=0): chi2(1)=4.37 Prob>chi2=0.0365					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.3: Interaction Effects (secondary education*doctors discuss)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	0.000025	0.0002	0.8820	-0.0003	0.0004
age squared (years)	-0.0183	0.0168	0.2770	-0.0513	0.0147
sex (0=male 1=female)	0.1916	0.1063	0.0720	-0.0168	0.4000
married (0=not married 1=married)	0.0761	0.1145	0.5060	-0.1483	0.3005
education (0=primary education)					
secondary	-0.0435	0.1731	0.8020	-0.3828	0.2959
tertiary	-0.1598	0.2250	0.4780	-0.6007	0.2811
urban	-0.1892	0.1134	0.0950	-0.4114	0.0330
feeling about household's income (0=living comfortable)					
coping at present income	-0.0058	0.1847	0.9750	-0.3677	0.3561
difficult on present income	-0.0369	0.1866	0.8430	-0.4026	0.3287
very difficult on present income	0.0442	0.2078	0.8320	-0.3632	0.4515
Health status					
health status (0=good)					
fair	0.3475	0.1759	0.0480	0.0027	0.6924
bad	0.1977	0.3264	0.5450	-0.4419	0.8374
disability (0=no. 1=yes)	0.0109	0.1957	0.9550	-0.3726	0.3944
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1288	0.1103	0.2430	-0.3451	0.0875
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0532	0.1099	0.6290	-0.2687	0.1623
Worried of side effects (0=no & to some extend. 1=yes)	-0.1231	0.1130	0.2760	-0.3446	0.0983
Doctor-patient relationship					
believe people can cure themselves *	0.2346	0.1329	0.0770	-0.0258	0.4950
believe people rely too much on doctors *	0.0371	0.1053	0.7250	-0.1693	0.2434
believe when people sure of medicine doctor should prescribe *	0.2023	0.1214	0.0960	-0.0356	0.4401
feel disappointed when leave without prescription *	0.1965	0.1813	0.2790	-0.1589	0.5519
believe doctors keep the whole truth **	-0.1152	0.1294	0.3730	-0.3688	0.1384
believe doctors treat patients as equals **	0.1548	0.1127	0.1700	-0.0662	0.3757
believe doctors discuss treatment before they decide **	-0.3460	0.1719	0.0440	-0.6829	-0.0092
believe patients are reluctant to ask questions **	0.2778	0.1244	0.0260	0.0340	0.5217
believe doctors admit their mistakes **	0.1183	0.1778	0.5060	-0.2301	0.4667
believe doctors use words patients find difficult to understand **	0.1385	0.1112	0.2130	-0.0794	0.3565
Interaction effect (secondary education*doctors discuss)	0.1917	0.2194	0.3820	-0.2383	0.6218
constant	-0.9927	0.4735	0.0360	-1.9208	-0.0646
athrho	1.5571	0.6584	0.0180	0.2666	2.8476
rho	0.9149	0.1072		0.2605	0.9933
Wald test of indep. Eqns. (rho=0): chi2(1)=5.59 Prob>chi2=0.0180					
* 0=not agree. 1=agree					
** 0=no & to some extend. 1=yes					

Table A4.4: Interaction Effects (tertiary education*doctors discuss)

	coefficient	Stand. Error	z	95% C.I.	
Socio-demographic factors					
age (years)	0.000029	0.0002	0.1800	-0.0003	0.0004
age squared (years)	-0.0190	0.0167	-1.1400	-0.0516	0.0137
sex (0=male 1=female)	0.1926	0.1060	1.8200	-0.0152	0.4003
married (0=not married 1=married)	0.0793	0.1144	0.6900	-0.1450	0.3035
education (0=primary education)					
secondary	0.0387	0.1377	0.2800	-0.2311	0.3086
tertiary	-0.3054	0.2374	-1.2900	-0.7707	0.1599
urban	-0.1908	0.1131	-1.6900	-0.4124	0.0309
feeling about household's income (0=living comfortable)					
coping at present income	-0.0187	0.1821	-0.1000	-0.3757	0.3383
difficult on present income	-0.0540	0.1845	-0.2900	-0.4156	0.3075
very difficult on present income	0.0305	0.2075	0.1500	-0.3761	0.4371
Health status					
health status (0=good)					
fair	0.3421	0.1752	1.9500	-0.0014	0.6855
bad	0.1929	0.3246	0.5900	-0.4433	0.8291
disability (0=no. 1=yes)	0.0156	0.1944	0.0800	-0.3653	0.3966
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1354	0.1101	-1.2300	-0.3511	0.0804
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0594	0.1094	-0.5400	-0.2739	0.1551
Worried of side effects (0=no & to some extend. 1=yes)	-0.1185	0.1117	-1.0600	-0.3374	0.1003
Doctor-patient relationship					
believe people can cure themselves *	0.2369	0.1323	1.7900	-0.0223	0.4962
believe people rely too much on doctors *	0.0363	0.1056	0.3400	-0.1706	0.2432
believe when people sure of medicine doctor should prescribe *	0.2103	0.1207	1.7400	-0.0262	0.4469
feel disappointed when leave without prescription *	0.1964	0.1797	1.0900	-0.1558	0.5486
believe doctors keep the whole truth **	-0.1157	0.1280	-0.9000	-0.3666	0.1353
believe doctors treat patients as equals **	0.1618	0.1123	1.4400	-0.0583	0.3819
believe doctors discuss treatment before they decide **	-0.2692	0.1117	-2.4100	-0.4882	-0.0503
believe patients are reluctant to ask questions **	0.2710	0.1254	2.1600	0.0252	0.5169
believe doctors admit their mistakes **	0.1147	0.1770	0.6500	-0.2323	0.4617
believe doctors use words patients find difficult to understand **	0.1563	0.1100	1.4200	-0.0593	0.3719
Interaction effect (tertiary education*doctors discuss)	0.3446	0.3368	1.0200	-0.3155	1.0047
constant	-0.9970	0.4719	-2.1100	-1.9218	-0.0721
athrho	1.4537	0.6772	2.1500	0.1264	2.7810
rho	0.8964	0.1330		0.1257	0.9923
Wald test of indep. Eqns. (rho=0): chi2(1)=4.61 Prob>chi2=0.0318					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.5: Interaction Effects (secondary education*doctors treat patients as equals)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	0.000035	0.0002	0.8330	-0.0003	0.0004
age squared (years)	-0.0194	0.0166	0.2430	-0.0519	0.0132
sex (0=male 1=female)	0.1873	0.1065	0.0790	-0.0215	0.3961
married (0=not married 1=married)	0.0785	0.1145	0.4930	-0.1459	0.3029
education (0=primary education)					
secondary	-0.0345	0.1624	0.8320	-0.3528	0.2839
tertiary	-0.1529	0.2205	0.4880	-0.5851	0.2793
urban	-0.1878	0.1127	0.0960	-0.4088	0.0332
feeling about household's income (0=living comfortable)					
coping at present income	-0.0041	0.1833	0.9820	-0.3634	0.3551
difficult on present income	-0.0390	0.1854	0.8330	-0.4023	0.3244
very difficult on present income	0.0417	0.2073	0.8410	-0.3646	0.4479
Health status					
health status (0=good)					
fair	0.3408	0.1753	0.0520	-0.0029	0.6844
bad	0.1818	0.3225	0.5730	-0.4504	0.8139
disability (0=no. 1=yes)	0.0159	0.1943	0.9350	-0.3650	0.3967
Health system					
choice regarding GP (0=not enough.1=enough choice)	-0.1307	0.1098	0.2340	-0.3459	0.0845
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0561	0.1097	0.6090	-0.2712	0.1589
Worried of side effects (0=no & to some extend. 1=yes)	-0.1260	0.1128	0.2640	-0.3470	0.0950
Doctor-patient relationship					
believe people can cure themselves *	0.2339	0.1324	0.0770	-0.0257	0.4934
believe people rely too much on doctors *	0.0335	0.1056	0.7510	-0.1736	0.2405
believe when people sure of medicine doctor should prescribe *	0.2013	0.1210	0.0960	-0.0359	0.4384
feel disappointed when leave without prescription *	0.1950	0.1797	0.2780	-0.1573	0.5473
believe doctors keep the whole truth **	-0.1128	0.1290	0.3820	-0.3657	0.1401
believe doctors treat patients as equals **	0.0693	0.1642	0.6730	-0.2525	0.3911
believe doctors discuss treatment before they decide **	-0.2376	0.1089	0.0290	-0.4510	-0.0242
believe patients are reluctant to ask questions **	0.2759	0.1253	0.0280	0.0302	0.5216
believe doctors admit their mistakes **	0.1201	0.1774	0.4980	-0.2276	0.4678
believe doctors use words patients find difficult to understand **	0.1461	0.1102	0.1850	-0.0699	0.3622
Interaction effects (secondary education*doctors treat patients as equal)	0.1529	0.2048	0.4550	-0.2486	0.5544
constant	-0.9690	0.4738	0.0410	-1.8976	-0.0404
athrho	1.5954	0.6682	0.0170	0.2858	2.9049
rho	0.9210	0.1014		0.2783	0.9940
Wald test of indep. Eqns. (rho=0): chi2(1)=5.7 Prob>chi2=0.0170					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.6: Interaction Effects (tertiary education*doctors treat patients as equals)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	0.000035	0.0002	0.8300	-0.0003	0.0004
age squared (years)	-0.0195	0.0166	0.2420	-0.0521	0.0132
sex (0=male 1=female)	0.1835	0.1054	0.0820	-0.0230	0.3900
married (0=not married 1=married)	0.0772	0.1145	0.5000	-0.1471	0.3016
education (0=primary education)					
secondary	0.0374	0.1373	0.7860	-0.2317	0.3064
tertiary	-0.0414	0.2578	0.8720	-0.5466	0.4638
Urban	-0.1881	0.1129	0.0960	-0.4095	0.0332
feeling about household's income (0=living comfortable)					
coping at present income	-0.0138	0.1854	0.9410	-0.3773	0.3497
difficult on present income	-0.0483	0.1866	0.7960	-0.4140	0.3174
very difficult on present income	0.0341	0.2084	0.8700	-0.3743	0.4425
Health status					
health status (0=good)					
fair	0.3416	0.1750	0.0510	-0.0013	0.6846
bad	0.1956	0.3249	0.5470	-0.4412	0.8324
disability (0=no. 1=yes)	0.0165	0.1945	0.9330	-0.3648	0.3977
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1292	0.1103	0.2410	-0.3453	0.0869
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0537	0.1092	0.6230	-0.2678	0.1604
Worried of side effects (0=no & to some extend. 1=yes)	-0.1271	0.1126	0.2590	-0.3477	0.0936
Doctor-patient relationship					
believe people can cure themselves *	0.2402	0.1325	0.0700	-0.0195	0.4999
believe people rely too much on doctors *	0.0337	0.1056	0.7490	-0.1732	0.2407
believe when people sure of medicine doctor should prescribe *	0.2061	0.1201	0.0860	-0.0293	0.4414
feel disappointed when leave without prescription *	0.1911	0.1793	0.2870	-0.1603	0.5424
believe doctors keep the whole truth **	-0.1074	0.1272	0.3980	-0.3567	0.1419
believe doctors treat patients as equals **	0.1822	0.1166	0.1180	-0.0463	0.4108
believe doctors discuss treatment before they decide **	-0.2383	0.1089	0.0290	-0.4518	-0.0248
believe patients are reluctant to ask questions **	0.2685	0.1249	0.0320	0.0237	0.5134
believe doctors admit their mistakes **	0.1147	0.1774	0.5180	-0.2330	0.4625
believe doctors use words patients find difficult to understand **	0.1462	0.1098	0.1830	-0.0690	0.3615
Interaction effect (tertiary education*doctors treat patients as equal)	-0.2608	0.3436	0.4480	-0.9343	0.4126
constant	-1.0131	0.4701	0.0310	-1.9345	-0.0918
athrho	1.4832	0.8652	0.0860	-0.2126	3.1790
rho	0.9020674	0.1612		-0.2095	0.9965
Wald test of indep. Eqns. (rho=0): chi2(1)=2.94 Prob>chi2=0.0865					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.7: Interaction Effects (age*doctors use difficult words)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	0.000028	0.0002	0.8640	-0.0003	0.0003
age squared (years)	-0.0192	0.0167	0.2500	-0.0519	0.0135
sex (0=male 1=female)	0.1884	0.1061	0.0760	-0.0194	0.3963
married (0=not married 1=married)	0.0764	0.1139	0.5020	-0.1468	0.2996
education (0=primary education)					
secondary	0.0426	0.1380	0.7570	-0.2278	0.3130
tertiary	-0.1534	0.2206	0.4870	-0.5858	0.2790
urban	-0.1917	0.1136	0.0920	-0.4144	0.0310
feeling about household's income (0=living comfortable)					
coping at present income	-0.0060	0.1842	0.9740	-0.3670	0.3550
difficult on present income	-0.0402	0.1863	0.8290	-0.4054	0.3250
very difficult on present income	0.0387	0.2075	0.8520	-0.3680	0.4453
Health status					
health status (0=good)					
fair	0.3447	0.1752	0.0490	0.0013	0.6880
bad	0.1925	0.3214	0.5490	-0.4373	0.8224
disability (0=no. 1=yes)	0.0119	0.1941	0.9510	-0.3686	0.3923
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1292	0.1101	0.2410	-0.3451	0.0866
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0555	0.1096	0.6130	-0.2703	0.1594
Worried of side effects (0=no & to some extend. 1=yes)	-0.1259	0.1122	0.2620	-0.3457	0.0939
Doctor-patient relationship					
believe people can cure themselves *	0.2389	0.1324	0.0710	-0.0206	0.4984
believe people rely too much on doctors *	0.0356	0.1053	0.7350	-0.1708	0.2421
believe when people sure of medicine doctor should prescribe *	0.2079	0.1205	0.0850	-0.0283	0.4441
feel disappointed when leave without prescription *	0.1999	0.1805	0.2680	-0.1538	0.5536
believe doctors keep the whole truth **	-0.1148	0.1286	0.3720	-0.3669	0.1373
believe doctors treat patients as equals **	0.1576	0.1125	0.1610	-0.0629	0.3780
believe doctors discuss treatment before they decide **	-0.2352	0.1089	0.0310	-0.4486	-0.0218
believe patients are reluctant to ask questions **	0.2708	0.1246	0.0300	0.0265	0.5151
believe doctors admit their mistakes **	0.1122	0.1776	0.5270	-0.2358	0.4603
believe doctors use words patients find difficult to understand **	0.0691	0.3093	0.8230	-0.5370	0.6753
Interaction effect (age*doctors use difficult words)	0.0016	0.0062	0.7920	-0.0104	0.0137
constant	-1.0075	0.4793	0.0360	-1.9470	-0.0680
athrho	1.5899	1.0517	0.1310	-0.4713	3.6512
rho	0.9201	0.1613		-0.4393	0.9987
Wald test of indep. Eqns. (rho=0): chi2(1)=2.29 Prob>chi2=0.1306					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.8: Interaction Effects (secondary education*doctors use difficult words)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	0.0000	0.0002	0.8610	-0.0003	0.0004
age squared (years)	-0.0187	0.0166	0.2590	-0.0512	0.0138
sex (0=male 1=female)	0.1837	0.1058	0.0830	-0.0237	0.3911
married (0=not married 1=married)	0.0744	0.1143	0.5150	-0.1497	0.2984
education (0=primary education)					
secondary	0.0877	0.1634	0.5910	-0.2324	0.4079
tertiary	-0.1452	0.2224	0.5140	-0.5811	0.2908
urban	-0.1919	0.1140	0.0920	-0.4153	0.0315
feeling about household's income (0=living comfortable)					
coping at present income	-0.0074	0.1841	0.9680	-0.3683	0.3535
difficult on present income	-0.0412	0.1863	0.8250	-0.4063	0.3239
very difficult on present income	0.0337	0.2085	0.8720	-0.3750	0.4424
Health status					
health status (0=good)					
fair	0.3427	0.1749	0.0500	-0.0001	0.6854
bad	0.1900	0.3232	0.5560	-0.4434	0.8234
disability (0=no. 1=yes)	0.0085	0.1937	0.9650	-0.3711	0.3880
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1288	0.1101	0.2420	-0.3446	0.0870
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.0520	0.1099	0.6360	-0.2673	0.1633
Worried of side effects (0=no & to some extend. 1=yes)	-0.1250	0.1125	0.2670	-0.3455	0.0956
Doctor-patient relationship					
believe people can cure themselves *	0.2394	0.1323	0.0700	-0.0199	0.4987
believe people rely too much on doctors *	0.0361	0.1055	0.7330	-0.1708	0.2429
believe when people sure of medicine doctor should prescribe *	0.2087	0.1204	0.0830	-0.0273	0.4447
feel disappointed when leave without prescription *	0.1912	0.1820	0.2930	-0.1654	0.5479
believe doctors keep the whole truth **	-0.1136	0.1289	0.3780	-0.3663	0.1391
believe doctors treat patients as equals **	0.1564	0.1123	0.1640	-0.0637	0.3764
believe doctors discuss treatment before they decide **	-0.2315	0.1096	0.0350	-0.4463	-0.0167
believe patients are reluctant to ask questions **	0.2747	0.1254	0.0280	0.0290	0.5204
believe doctors admit their mistakes **	0.1097	0.1789	0.5400	-0.2409	0.4603
believe doctors use words patients find difficult to understand **	0.2183	0.1600	0.1720	-0.0953	0.5320
Interaction effect (secondary education*doctors use difficult words)	-0.1377	0.2219	0.5350	-0.5726	0.2971
constant	-1.0568	0.4754	0.0260	-1.9886	-0.1250
athrho	1.4827	0.7489	0.0480	0.0149	2.9506
rho	0.9020	0.1396		0.0149	0.9945
Wald test of indep. Eqns. (rho=0): chi2(1)=3.92 Prob>chi2=0.0477					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.9: Interaction Effects (health* people can cure themselves)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	-0.00009	0.000038	0.018	-0.00016	-0.000015
age squared (years)	0.0022	0.0042	0.59	-0.0060	0.0106
sex (0=male 1=female)	0.0830	0.0377	0.028	0.0091	0.1570
married (0=not married 1=married)	-0.0939	0.0294	0.001	-0.1518	-0.0361
education (0=primary education)					
secondary	0.0511	0.0506	0.313	-0.0481	0.1504
tertiary	0.0821	0.0567	0.148	-0.0291	0.1934
urban	0.0482	0.0278	0.083	-0.0062	0.1027
feeling about household's income (0=living comfortable)					
coping at present income	-0.0430	0.0229	0.057	-0.0886	0.0013
difficult on present income	0.0403	0.0190	0.034	0.0030	0.0776
very difficult on present income	0.0053	0.0606	0.93	-0.1136	0.1242
Health status					
health status (0=good)					
fair	-0.1123	0.0407	0.006	-0.1921	-0.0324
bad	-0.1993	0.0613	0.001	-0.3196	-0.0791
disability (0=no. 1=yes)	0.0825	0.0446	0.065	-0.0050	0.1701
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1266	0.0330	<0.001	-0.1915	-0.0618
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.1221	0.0854	0.153	-0.2896	0.0454
Worried of side effects (0=no & to some extend. 1=yes)	0.0363	0.0542	0.503	-0.0699	0.1427
Doctor-patient relationship					
believe people can cure themselves *	-0.0408	0.0926	0.66	-0.2223	0.1407
believe people rely too much on doctors *	0.0915	0.0259	<0.001	0.0406	0.1424
believe when people sure of medicine doctor should prescribe *	0.1291	0.0191	<0.001	0.0916	0.1667
feel disappointed when leave without prescription *	0.1627	0.0360	<0.001	0.0921	0.2333
believe doctors keep the whole truth **	0.1007	0.0431	0.02	0.0160	0.1853
believe doctors treat patients as equals **	-0.1665	0.0218	<0.001	-0.2094	-0.1237
believe doctors discuss treatment before they decide **	-0.1215	0.0448	0.007	-0.2095	-0.0335
believe patients are reluctant to ask questions **	0.0565	0.0227	0.013	0.0119	0.1010
believe doctors admit their mistakes **	0.0024	0.0732	0.973	-0.1410	0.1459
believe doctors use words patients find difficult to understand **	0.0201	0.0177	0.256	-0.0146	0.0550
Interaction effect (health*believe people can cure themselves)	0.1312	0.0455	0.004	0.0419	0.2205
constant	-0.59817	0.1255	<0.001	-0.8442	-0.3520
athrho	0.3197	0.1170	0.006	0.09024	0.5492
rho	0.309	0.1058		0.09000	0.4999
Wald test of indep. Eqns. (rho=0): chi2=7.46 Prob>chi2=0.0063					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.10: Interaction Effects (health* people rely too much)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	-0.0001	0.0000	0.0180	-0.00016	0.000015
age squared (years)	0.0021	0.0041	0.6160	-0.0060	0.0102
sex (0=male 1=female)	0.0822	0.0376	0.0290	0.0086	0.1559
married (0=not married 1=married)	-0.0931	0.0291	0.0010	-0.1502	-0.0361
education (0=primary education)					
secondary	0.0531	0.0505	0.2930	-0.0459	0.1521
tertiary	0.0851	0.0570	0.1350	-0.0266	0.1968
urban	0.0480	0.0279	0.0850	-0.0066	0.1027
feeling about household's income (0=living comfortable)					
coping at present income	-0.0426	0.0236	0.0720	-0.0889	0.0037
difficult on present income	0.0411	0.0189	0.0300	0.0040	0.0782
very difficult on present income	0.0048	0.0590	0.9350	-0.1109	0.1205
Health status					
health status (0=good)					
fair	-0.0065	0.0674	0.9230	-0.1385	0.1255
bad	-0.0947	0.0510	0.0630	-0.1947	0.0052
disability (0=no. 1=yes)	0.0828	0.0452	0.0670	-0.0059	0.1714
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1263	0.0331	<0.001	-0.1911	-0.0615
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.1222	0.0858	0.1550	-0.2904	0.0460
Worried of side effects (0=no & to some extend. 1=yes)	0.0363	0.0547	0.5070	-0.0709	0.1436
Doctor-patient relationship					
believe people can cure themselves *	0.0196	0.0793	0.8050	-0.1357	0.1749
believe people rely too much on doctors *	0.0878	0.0421	0.0370	0.0053	0.1703
believe when people sure of medicine doctor should prescribe *	0.1298	0.0192	<0.001	0.0922	0.1675
feel disappointed when leave without prescription *	0.1646	0.0361	<0.001	0.0938	0.2354
believe doctors keep the whole truth **	0.1007	0.0425	0.0180	0.0174	0.1840
believe doctors treat patients as equals **	-0.1667	0.0216	<0.001	-0.2090	-0.1244
believe doctors discuss treatment before they decide **	-0.1215	0.0442	0.0060	-0.2080	-0.0349
believe patients are reluctant to ask questions **	0.0570	0.0227	0.0120	0.0125	0.1015
believe doctors admit their mistakes **	0.0019	0.0731	0.9790	-0.1414	0.1453
believe doctors use words patients find difficult to understand **	0.0197	0.0177	0.2650	-0.0150	0.0545
Interaction effect (health*believe people rely too much)	0.0054	0.0819	0.9480	-0.1551	0.1658
constant	-0.6462	0.1213	<0.001	-0.8840	-0.4084
athrho	0.3197	0.1170	0.006	0.09024	0.5492
rho	0.309	0.1058		0.09000	0.4999
Wald test of indep. Eqns. (rho=0): chi2(1)=7.46 Prob>chi2=0.0063					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.11: Interaction Effects (health*treat patients as equals)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	-0.00008	0.000038	0.0210	-0.00016	-0.00001
age squared (years)	0.0021	0.0043	0.6250	-0.0063	0.0104
sex (0=male 1=female)	0.0823	0.0372	0.0270	0.0094	0.1551
married (0=not married 1=married)	-0.0931	0.0293	0.0010	-0.1505	-0.0358
education (0=primary education)					
secondary	0.0531	0.0504	0.2910	-0.0456	0.1519
tertiary	0.0852	0.0572	0.1370	-0.0270	0.1974
urban	0.0480	0.0280	0.0860	-0.0068	0.1029
feeling about household's income (0=living comfortable)					
coping at present income	-0.0426	0.0234	0.0680	-0.0885	0.0032
difficult on present income	0.0411	0.0188	0.0290	0.0042	0.0781
very difficult on present income	0.0050	0.0588	0.9320	-0.1102	0.1203
Health status					
health status (0=good)					
fair	-0.0063	0.0400	0.8760	-0.0847	0.0722
bad	-0.0947	0.0392	0.0160	-0.1715	-0.0179
disability (0=no. 1=yes)	0.0827	0.0451	0.0670	-0.0056	0.1710
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1264	0.0332	<0.001	-0.1916	-0.0613
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.1222	0.0860	0.1550	-0.2908	0.0464
Worried of side effects (0=no & to some extend. 1=yes)	0.0363	0.0544	0.5040	-0.0703	0.1430
Doctor-patient relationship					
believe people can cure themselves *	0.0195	0.0788	0.8040	-0.1349	0.1740
believe people rely too much on doctors *	0.0900	0.0260	0.0010	0.0390	0.1410
believe when people sure of medicine doctor should prescribe *	0.1298	0.0192	<0.001	0.0921	0.1675
feel disappointed when leave without prescription *	0.1646	0.0363	<0.001	0.0934	0.2358
believe doctors keep the whole truth **	0.1007	0.0425	0.0180	0.0174	0.1840
believe doctors treat patients as equals **	-0.1698	0.0266	<0.001	-0.2220	-0.1176
believe doctors discuss treatment before they decide **	-0.1214	0.0448	0.0070	-0.2091	-0.0336
believe patients are reluctant to ask questions **	0.0569	0.0227	0.0120	0.0124	0.1015
believe doctors admit their mistakes **	0.0019	0.0735	0.9800	-0.1422	0.1459
believe doctors use words patients find difficult to understand **	0.0198	0.0179	0.2670	-0.0152	0.0548
Interaction effect (health*believe doctors treat as equals)	0.0080	0.0406	0.8440	-0.0715	0.0875
constant	-0.6461	0.1229	<0.001	-0.8871	-0.4052
athrho	0.3110	0.1152	0.0070	0.0852	0.5367
rho	0.3013	0.1047		0.0850	0.4905
Wald test of indep. Eqns. (rho=0): chi2(1)=7.29 Prob>chi2=0.0069					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table A4.12: Interaction Effects (health*doctors discuss)

	coefficient	Stand. Error	p>|z|	95% C.I.	
Socio-demographic factors					
age (years)	-0.000089	0.00003	0.019	-0.00016	-0.00001
age squared (years)	0.0021	0.0042	0.6140	-0.0061	0.0104
sex (0=male 1=female)	0.0833	0.0367	0.0230	0.0115	0.1552
married (0=not married 1=married)	-0.0933	0.0296	0.0020	-0.1513	-0.0353
education (0=primary education)					
secondary	0.0527	0.0500	0.2920	-0.0453	0.1507
tertiary	0.0840	0.0564	0.1360	-0.0266	0.1946
urban	0.0482	0.0282	0.0880	-0.0072	0.1035
feeling about household's income (0=living comfortable)					
coping at present income	-0.0421	0.0234	0.0720	-0.0880	0.0038
difficult on present income	0.0416	0.0184	0.0240	0.0056	0.0776
very difficult on present income	0.0073	0.0598	0.9020	-0.1099	0.1246
Health status					
health status (0=good)					
fair	-0.0513	0.0360	0.1550	-0.1220	0.0193
bad	-0.1362	0.0266	<0.001	-0.1883	-0.0841
disability (0=no. 1=yes)	0.0799	0.0439	0.0690	-0.0062	0.1660
Health system					
choice regarding GP (0=not enough. 1=enough choice)	-0.1266	0.0335	<0.001	-0.1922	-0.0610
prefer same doctor (0=not same or indifferent. 1=same doctor)	-0.1226	0.0862	0.1550	-0.2915	0.0464
Worried of side effects (0=no & to some extend. 1=yes)	0.0371	0.0530	0.4840	-0.0668	0.1410
Doctor-patient relationship					
believe people can cure themselves *	0.0194	0.0787	0.8060	-0.1349	0.1737
believe people rely too much on doctors *	0.0883	0.0262	0.0010	0.0369	0.1396
believe when people sure of medicine doctor should prescribe *	0.1301	0.0195	<0.001	0.0919	0.1682
feel disappointed when leave without prescription *	0.1644	0.0363	<0.001	0.0932	0.2356
believe doctors keep the whole truth **	0.1015	0.0426	0.0170	0.0181	0.1850
believe doctors treat patients as equals **	-0.1649	0.0213	<0.001	-0.2066	-0.1232
believe doctors discuss treatment before they decide **	-0.1694	0.0235	<0.001	-0.2155	-0.1232
believe patients are reluctant to ask questions **	0.0553	0.0218	0.0110	0.0126	0.0979
believe doctors admit their mistakes **	0.0004	0.0739	0.9960	-0.1445	0.1453
believe doctors use words patients find difficult to understand **	0.0207	0.0174	0.2330	-0.0134	0.0549
Interaction effect (health*believe doctors discuss)	0.1169	0.0991	0.2380	-0.0774	0.3111
constant	-0.6236	0.1130	<0.001	-0.8450	-0.4021
athrho	0.3119	0.1251	0.0130	0.0668	0.5570
rho	0.3022	0.1136		0.0667	0.5058
Wald test of indep. Eqns. (rho=0): chi2(1)=6.22 Prob>chi2=0.0126					

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

APPENDIX B

B.1 The questionnaire (English version)

Section 1: Clinical characteristics

Q1.01 How is your health in general? Would you say it is…

1	2	3	4	5	9
Very Good	*Good*	*Fair*	*Bad*	*Very bad*	*(DA)*

Q1.02 Are you hampered in your daily activities in any way by any longstanding illness, or disability, infirmity or mental health problem? If yes, is that a lot or to some extent?

1	2	3	9
Yes, a lot	*Yes, to some extend*	*No*	*(DA)*

Q1.03 Do you smoke or did you ever smoke?

1	2	3	4	5	9
Smoke daily	*Smoke occasionally*	*Do not smoke, used to smoke daily*	*Do not smoke, used to smoke occasionally*	*Never smoked*	*(DA)*

Section 2: Information Channels

Q2.01 *Please indicate whether you use the following sources to get information regarding* ***blood pressure****:*

Family/Friends	☐
Doctor	☐

Pharmacist	☐
Nurse	☐
Other patients with high blood pressure	☐
The media (TV, Radio, Newspaper)	☐
Internet	☐
Magazines on health issues and nutrition	☐
Other (please specify).....	☐
(DA)	☐

Q2.02 *Please indicate whether you use the following sources to get information regarding* ***medication for blood pressure****:*

Family/Friends	☐
Doctor	☐
Pharmacist	☐
Nurse	☐
Other patients with high blood pressure	☐
The media (TV, Radio, Newspaper)	☐
Internet	☐
Magazines on health issues and nutrition	☐
Other (please specify).....	☐
(DA)	☐

Now, please indicate whether the following statements apply to you:

1 *Yes*	**2** *No*	**9** *(DA)*	
Q2.03 I am well informed about blood pressure.			☐
Q2.04 I am well informed about the medication I take for blood pressure.			☐

Section 3: Beliefs vs. Actual facts

Please tell us how much you agree or disagree with each of the following statements, using the scale below:

1	2	3	4	5	9
Agree strongly	*Agree*	*Neither agree nor disagree*	*Disagree*	*Disagree strongly*	*(DA)*

Q3.01a High blood pressure can be treated without medication. ☐

Q3.02a People who use medication regulate their blood pressure. ☐

Q3.03a Medication for blood pressure has many side effects for those who use it. ☐

Q3.04a People who take blood pressure medication become addicted to it due to its long-term use. ☐

Q3.05a People with high blood pressure are dependent on their medication for life. ☐

Now, please indicate whether the following statements apply to you:

1	2	9
Yes	*No*	*(DA)*

Q3.01b In the past, I have been successful in treating my blood pressure without the use of medication. ☐

Q3.02b I have regulated my blood pressure thanks to the medication I have been taking. ☐

Q3.03b I have personally experienced side effects due to the use of the prescribed medication. ☐

Q3.04b I feel I have become addicted to my medication for blood pressure as a result of long-term use. ☐

Q3.05b I will always be dependent on my medication for blood pressure. ☐

Section 4: Doctor-patient relationship

Please tell me how much you agree or disagree with each of the following statements, using the scale below:

1	2	3	4	5	8	9
Agree strongly	*Agree*	*Neither agree nor disagree*	*Disagree*	*Disagree strongly*	*(DK)*	*(DA)*

Q4.01 Most illnesses cure themselves without having to go to a doctor. ☐

Q4.02 People rely too much on their doctors rather than themselves to keep healthy. ☐

Q4.03 When people are sure about what medicine they need, their doctor should just prescribe it for them. ☐

Q4.04 It is best to follow doctors' orders. ☐

Q4.05 I generally feel a bit disappointed when I leave a doctor's surgery without a prescription. ☐

*Using the scale below, please indicate how often you think the following applies to **doctors in general:***

1	2	3	4	5	8	9
Never or almost never	*Some of the time*	*About half of the time*	*Most of the time*	*Always or almost always*	*(DK)*	*(DA)*

Q4.06 Doctors keep the whole truth from their patients. ☐

Q4.07 Before doctors decide on a treatment, they discuss it with their patient. ☐

Q4.08 Patients are reluctant to ask their doctor all the questions they'd like to ask. ☐

Q4.09 Doctors are willing to admit their mistakes to their patients. ☐

Q4.10 Doctors use words or phrases that their patients find difficult to understand. ☐

*The following questions refer to the **last time you consulted your doctor for blood pressure.** Please indicate whether the following statements apply to you:*

1	2	9
Yes	*No*	*(DA)*

The last time I visited my doctor….

Q4.11 …the doctor did not have much time for me. ☐

***Q4.12** ….I discussed everything regarding my condition with the doctor.* ☐

Q4.13 …I discussed everything regarding the prescribed medication with the doctor. ☐

Q4.14 …the doctor explained to me everything I needed to know about blood pressure. ☐

Q4.15 ….the doctor explained to me everything I needed to know about the prescribed medication. ☐

Q4.16 …the doctor explained to me the medication's side effects and how to deal with them. ☐

Q4.17 …I was generally satisfied with the outcome of the visit. ☐

Section 5: Measurement of non-adherence

People often have difficulty taking their pills for one reason or another….

Q5.01 Do you ever forget to take your medicine?

1	*2*	*9*
Yes	*No*	*(DA)*

Q5.02 Are you careless at times about taking your medicine?

1	*2*	*9*
Yes	*No*	*(DA)*

Q5.03 When you feel better do you sometimes stop taking your medicine?

1	*2*	*9*
Yes	*No*	*(DA)*

Q5.04 Sometimes if you feel worse when you take the medicine, do you stop taking it?

1	*2*	*9*
Yes	*No*	*(DA)*

Section 6: Risk

Please tell me how much you agree or disagree with each of the following statements, using the scale below:

1	**2**	**3**	**4**	**5**	**6**
Agree strongly	*Agree*	*Neither agree nor disagree*	*Disagree*	*Disagree strongly*	*(DK)*

Q6.01 Untreated high-blood pressure can lead to:

- ❑ …strokes. ☐
- ❑ *....heart attack.* ☐
- ❑ …heart failure. ☐
- ❑ …kidney failure. ☐

Q6.02 Which is more important risk factor (tick the answer):

- ❑ The "top" (systolic) blood pressure. ☐
- ❑ The "bottom" (diastolic) blood pressure. ☐
- ❑ They are equally important. ☐
- ❑ (DK) ☐

Section 7: Demographic questions For statistical purposes, we would like to ask you…

Q7.01 In what year were you born?

Q7.02 What is the highest level of education you have completed? (please circle)

1. Never been to school
2. Primary School
3. Junior High School
4. High School
5. Technical School
6. Technical College
7. University
8. Post-Graduate studies
9. (DA)

Q7.03 What is your marital status?

Single	Married	Divorced	Widow	(DA)
1	2	3	4	9

Q7.04 Do you have children?

1	*2*	*9*
Yes	*No*	*(DA)*

Q7.05 Are you currently living alone?

1	*2*	*9*
Yes	*No*	*(DA)*

Q7.06 Which of the following descriptions comes closest to how you feel about your household's income nowadays?

Living comfortably on present income	1
Coping on present income	2
Find it difficult on present income	3
Finding it very difficult on present income	4
(DK)	8
(DA)	9

B.2 The questionnaire (Greek version)

Q1.01 Γενικά πώς είναι η υγεία σας; Θα λέγατε ότι είναι...

1	2	3	4	5	8
Πολύ καλή	*Καλή*	*Μέτρια*	*Κακή*	*Πολύ κακή*	*(ΔΓ)*

Q1.02 Στις καθημερινές σας δραστηριότητες συναντάτε εμπόδια εξαιτίας κάποιας χρόνιας ασθένειας ή αδυναμίας, αναπηρίας ή κάποιου προβλήματος ψυχικής υγείας; Αν ναι, πολύ ή σε κάποιο βαθμό;

1	2	3	8
Ναι, πολύ	*Ναι, σε κάποιο βαθμό*	*Όχι*	*(ΔΓ)*

Q1.03 Καπνίζετε ή καπνίζατε ποτέ;

1	2	3	4	5	6
Καπνίζω καθημερινά	*Καπνίζω περιστασιακά*	*Δεν καπνίζω, κάπνιζα στο παρελθόν*	*Δεν καπνίζω, κάπνιζα περιστασιακά*	*Δεν έχω καπνίσει ποτέ*	*(ΔΓ)*

Q2.01 *Πείτε μας σας παρακαλώ ποιες από τις παρακάτω πηγές χρησιμοποιείτε για να παίρνετε πληροφορίες σχετικά με την* ***πίεση****:*

Οικογένεια/Φίλοι	☐
Γιατρός	☐
Φαρμακοποιός	☐
Νοσοκόμος	☐
Άλλοι ασθενείς με πίεση	☐
ΜΜΕ (TV, Ράδιο, Εφημερίδα)	☐

Internet	☐
Περιοδικά με θέματα υγείας και διατροφής (π.χ. Vita, Forma κ.τ.λ.)	☐
Άλλο (παρακαλώ αναφέρετε).....	☐

Q2.02 *Πείτε μας ποιες από τις παρακάτω πηγές χρησιμοποιείτε για να παίρνετε πληροφορίες σχετικά με* ***τα φάρμακα για την πίεση;***

Οικογένεια/Φίλοι	☐
Γιατρός	☐
Φαρμακοποιός	☐
Νοσοκόμος	☐
Άλλοι ασθενείς με πίεση	☐
ΜΜΕ (TV, Ράδιο, Εφημερίδα)	☐
Internet	☐
Περιοδικά με θέματα υγείας και διατροφής (π.χ. Vita, Forma κ.τ.λ.)	☐
Άλλο (παρακαλώ αναφέρετε).....	☐

Τώρα πείτε μου, σας παρακαλώ, αν οι παρακάτω φράσεις ισχύουν για σας:

	1	**2**	**6**
	Ναι	*Όχι*	*(ΔΓ)*
Q2.03 Είμαι καλά ενημερωμένος/η σχετικά με την πίεση.	☐	☐	☐
Q2.04 Είμαι καλά ενημερωμένος/η σχετικά με τα φάρμακα που παίρνω για την πίεση.	☐	☐	☐

Παρακαλώ πείτε μου αν συμφωνείτε ή διαφωνείτε με κάθε μια από τις παρακάτω προτάσεις:

1	2	3	4	5	6
Συμφωνώ απόλυτα	*Συμφωνώ*	*(Ούτε συμφωνώ ούτε διαφωνώ)*	*Διαφωνώ*	*Διαφωνώ απόλυτα*	*(ΔΓ)*

Q3.01a Η πίεση μπορεί να αντιμετωπιστεί χωρίς φάρμακα. ☐

Q3.02a Οι άνθρωποι που χρησιμοποιούν φάρμακα ρυθμίζουν την πίεσή τους. ☐

Q3.03a Τα φάρμακα για την πίεση έχουν πολλές παρενέργειες για αυτούς που τα χρησιμοποιούν. ☐

Q3.04a Οι άνθρωποι που παίρνουν φάρμακα για την πίεση εθίζονται σε αυτά εξαιτίας της μακροχρόνιας χρήσης. ☐

Q3.05a Οι άνθρωποι με υψηλή πίεση εξαρτώνται από τα φάρμακά τους δια βίου. ☐

Τώρα πείτε μου σας παρακαλώ αν οι παρακάτω φράσεις ισχύουν για εσάς:

1	2	6
Ναι	*Όχι*	*(ΔΓ)*

Q3.01b Έχω προσπαθήσει με επιτυχία στο παρελθόν να αντιμετωπίσω την πίεση χωρίς τη χρήση φαρμάκων. ☐

Q3.02b Έχω ρυθμίσει την πίεση μου χάρη στα φάρμακα που χρησιμοποιώ. ☐

Q3.03b Έχω ο/η ίδιος/α παρατηρήσει παρενέργειες από τη χρήση των φαρμάκων για την πίεση που μου έχει γράψει ο γιατρός μου. ☐

Q3.04b Νιώθω ότι έχω εθιστεί στα φάρμακα για την πίεση εξαιτίας της μακροχρόνιας χρήσης. ☐

Q3.05b Θα είμαι πάντα εξαρτημένος από τα φάρμακα για την πίεση. ☐

Τώρα θα σας παρακαλούσα να μου πείτε πόσο συμφωνείτε ή διαφωνείτε με κάθε μία από τις παρακάτω απόψεις, χρησιμοποιώντας την ακόλουθη κλίμακα:

1	2	3	4	5	6
Συμφωνώ απόλυτα	*Συμφωνώ*	*(Ούτε συμφωνώ ούτε διαφωνώ)*	*Διαφωνώ*	*Διαφωνώ απόλυτα*	*(ΔΓ)*

Q4.01 Οι περισσότερες ασθένειες θεραπεύονται από μόνες τους, χωρίς να χρειάζεται να πας σε γιατρό. ☐

Q4.02 Οι άνθρωποι βασίζονται πολύ περισσότερο απ' ότι πρέπει στους γιατρούς τους, παρά στους εαυτούς τους για να μείνουν υγιείς. ☐

Q4.03 Όταν οι άνθρωποι είναι βέβαιοι για το ποιο φάρμακο χρειάζονται, ο γιατρός τους πρέπει απλά και μόνο να τους το γράφει σε συνταγή. ☐

Q4.04 Είναι καλύτερο να ακολουθεί κανείς τις οδηγίες των γιατρών. ☐

Q4.05 Γενικά, αισθάνομαι κάπως απογοητευμένος/η όταν φεύγω από τον γιατρό χωρίς συνταγή. ☐

Πείτε μου σας παρακαλώ πόσο συχνά νομίζετε ότι τα παρακάτω ισχύουν για τους γιατρούς γενικά, χρησιμοποιώντας την ακόλουθη κλίμακα:

1	2	3	4	5	6
Ποτέ ή σχεδόν ποτέ	*Κάποιες φορές*	*Τις μισές φορές*	*Τις περισσότερες φορές*	*Πάντα ή σχεδόν πάντα*	*(ΔΓ)*

Q4.06 Οι γιατροί δε λένε όλη την αλήθεια στους ασθενείς τους. ☐

Q4.07 Πριν οι γιατροί αποφασίσουν μια θεραπεία, την συζητούν με τον ασθενή τους. ☐

Q4.08 Οι ασθενείς διστάζουν να ρωτήσουν τους γιατρούς τους για όλα όσα θα ήθελαν να τους ρωτήσουν. ☐

Q4.09 Οι γιατροί είναι πρόθυμοι να παραδεχτούν τα λάθη τους στους ασθενείς τους. ☐

Q4.10 Οι γιατροί χρησιμοποιούν λέξεις ή φράσεις που οι ασθενείς τους δυσκολεύονται να καταλάβουν. ☐

Οι παρακάτω ερωτήσεις ζητούν τη γνώμη σας σχετικά με το(ους) γιατρό(ούς) που σας παρακολουθεί για την πίεσή σας. Παρακαλώ πείτε μου πόσο συμφωνείτε με καθεμία από τις παρακάτω προτάσεις, χρησιμοποιώντας την ακόλουθη κλίμακα:

1	**2**	**6**
Ναι	*Όχι*	*(ΔΓ)*

Κατά τη διάρκεια της τελευταίας επίσκεψής μου στο γιατρό….

Q4.11 …. ο γιατρός δεν είχε πολύ χρόνο να ασχοληθεί μαζί μου. ☐

Q4.12 *…. συζήτησα όλα τα θέματα σχετικά με την πίεσή μου με το γιατρό.* ☐

Q4.13 …. συζήτησα όλα τα θέματα σχετικά με τα φάρμακα που μου έγραψε ο γιατρός. ☐

Q4.14 …. ο γιατρός μού εξήγησε όλα όσα πρέπει να ξέρω σχετικά με την πίεση. ☐

Q4.15 ….ο γιατρός μού εξήγησε όλα όσα πρέπει να ξέρω σχετικά με τα φάρμακα για την πίεση. ☐

Q4.16 …ο γιατρός μού μίλησε για τις παρενέργειες των φαρμάκων και πώς να τις αντιμετωπίσω. ☐

Q4.17 …γενικά έμεινα ευχαριστημένος/η με το αποτέλεσμα της επίσκεψης. ☐

Πολλοί άνθρωποι συχνά δυσκολεύονται να παίρνουν τα φάρμακά τους για διάφορους λόγους. Εσείς...

Q5.01 ...ξεχνάτε ποτέ να πάρετε τα φάρμακά σας;

Ναι	*Όχι*	*(ΔΑ)*

Q5.02 ...είστε μερικές φορές αμελής στη λήψη των φαρμάκων;

Ναι	*Όχι*	*(ΔΑ)*

Q5.03 ...όταν νοιώθετε καλύτερα σταματάτε μερικές φορές να παίρνετε τα φάρμακα;

Ναι	*Όχι*	*(ΔΑ)*

Q5.04 ...αν μερικές φορές νοιώσετε χειρότερα όταν παίρνετε τα φάρμακα, τα σταματάτε;

Ναι	*Όχι*	*(ΔΑ)*

Τώρα θα σας παρακαλούσα να μου πείτε πόσο συμφωνείτε ή διαφωνείτε με κάθε μία από τις παρακάτω απόψεις, χρησιμοποιώντας την ακόλουθη κλίμακα:

1	2	3	4	5	6
Συμφωνώ απόλυτα	*Συμφωνώ*	*(Ούτε συμφωνώ ούτε διαφωνώ)*	*Διαφωνώ*	*Διαφωνώ απόλυτα*	*(ΔΓ)*

Q6.01 Η υψηλή πίεση, αν δεν αντιμετωπιστεί, μπορεί να οδηγήσει σε:

- ❑ …εγκεφαλικό επεισόδιο. ☐
- ❑ *....έμφραγμα του μυοκαρδίου.* ☐
- ❑ …καρδιακή ανεπάρκεια. ☐
- ❑ … νεφρική ανεπάρκεια. ☐

Q6.02 Ποια αποτελεί πιο σημαντικό παράγοντα κινδύνου:

- ❑ Η «μεγάλη» (συστολική) πίεση. ☐
- ❑ Η «μικρή» (διαστολική) πίεση. ☐
- ❑ Είναι το ίδιο σημαντικές. ☐
- ❑ (ΔΓ) ☐

Για καθαρά στατιστικούς λόγους θα ήθελα να μου πείτε...

Q7.01 Ποια χρονιά γεννηθήκατε;

Q7.02 Ποιο είναι το ανώτερο επίπεδο σπουδών που έχετε ολοκληρώσει;

a. Έως απόφοιτοι Δημοτικού
b. Απόφοιτοι 3τάξιου Γυμνασίου
c. Απόφοιτοι Λυκείου ή 6τάξιου Γυμνασίου
d. Απόφοιτοι ΙΕΚ/ Τεχνικών Σχολών
e. Πτυχιούχοι ΤΕΙ
f. Πτυχιούχοι ΑΕΙ
g. Κάτοχοι Μεταπτυχιακών τίτλων

Q7. 03 Ποια είναι η οικογενειακή σας κατάσταση;

Άγαμος/η	Έγγαμος/η	Διαζευγμένος/η	Χήρος/α	(ΔΑ)

Q7.04 Έχετε παιδιά;

Ναι	*Όχι*	*(ΔΑ)*

Q7.05 Μένετε μόνος/η?

Ναι	*Όχι*	*(ΔΑ)*

Q7.06 Ποια από τις παρακάτω περιγραφές πλησιάζει περισσότερο στην εικόνα που έχετε για το σημερινό εισόδημα του νοικοκυριού σας;

Με το σημερινό εισόδημα του νοικοκυριού ζεις άνετα	1
Με το σημερινό εισόδημα τα καταφέρνεις	2
Με το σημερινό εισόδημα τα βγάζεις πέρα δύσκολα	3
Με το σημερινό εισόδημα τα βγάζεις πέρα πολύ δύσκολα	4
(Δ.Γ.)	8

Table B1.1 Factor analysis for d-p relationship factors (Greek survey)

	Eigenvalue	Difference	Proportion	Cumulative
Factor1	0.69729	0.4465	13.655	13.655
Factor2	0.2508	0.14533	0.4911	18.566
Factor3	0.10547	0.07653	0.2065	20.631
Factor4	0.02894	0.03147	0.0567	21.198
Factor5	-0.00254	0.06456	-0.005	21.148
Factor6	-0.06709	0.01314	-0.1314	19.834
Factor7	-0.08023	0.09917	-0.1571	18.263
Factor8	-0.1794	0.06316	-0.3513	1.475
Factor9	-0.24256	.	-0.475	1

LR test: independent vs. saturated: chi2(36) = 144.64
Prob_chi2 < 0.001

Table B1.2: Factor analysis for d-p relationship factors with 4 factors

	Factor1	Factor2	Factor3	Factor4	Uniquenes s
people can cure themselves	-0.0522	0.1193	0.1705	0.0733	0.9486
people rely too much on doctors	-0.1777	0.1282	-0.098	0.0783	0.9363
if people sure of medicine doctor should prescribe	-0.2739	0.2785	0.0366	-0.0376	0.8451
its best to follow doctor's advice	0.0447	0.1104	-0.1297	0.0966	0.9597
feel disappointed when leave without prescription	-0.2953	-0.2579	0.0215	-0.0589	0.8424
doctors keep the whole truth	0.3911	0.1681	0.0679	0.0034	0.8142
patients are reluctant to ask questions	0.4547	0.1379	-0.048	-0.0468	0.7704
doctors admit their mistakes	0.1761	0.0641	0.1691	0.0322	0.9352
doctors use words patients find difficult to understand	0.3288	0.1117	-0.117	0.0001	0.8657

Table B2.1: Interaction effect (age*doctors use difficult words)

	Coef.	Std. Err.	P>t	95% C.I.	
Demographic and socioeconomic factors					
sex (0=male 1=female)	-0.0272	0.1533	0.859	-0.3286	0.2740
age (years)	-0.0102	0.0072	0.161	-0.0245	0.0040
education (0=primary education)					
secondary	-0.2423	0.2024	0.232	-0.6401	0.1555
tertiary	-0.1292	0.2194	0.556	-0.5605	0.3019
feeling about household's income (0=living comfortable)					
coping at present income	-0.0494	0.1785	0.782	-0.4004	0.3014
difficult on present income	0.2318	0.2212	0.295	-0.2029	0.6665
very difficult on present income	-0.0565	0.3014	0.851	-0.6488	0.5358
Health status					
health (0=(very good)					
fair	-0.0527	0.1831	0.774	-0.4126	0.3072
bad	-0.0688	0.2824	0.807	-0.6239	0.4861
hampered in daily activity (0=no 1=yes)	0.1919	0.1710	0.262	-0.1442	0.5280
Doctor-patient relationship					
believe illnesses cure themselves without visiting a doctor *	0.0832	0.2178	0.703	-0.3448	0.5112
believe people rely too much on doctors *	0.0144	0.1519	0.925	-0.2841	0.3129
believe when people sure of medicine doctor should prescribe *	-0.1537	0.1522	0.313	-0.4529	0.1454
believe it's best to follow doctor's advice *	-1.4547	0.5283	0.006	-2.4930	-0.4164
feel disappointed when leave without prescription *	0.0374	0.2465	0.879	-0.4471	0.5220
believe doctors keep the whole truth **	0.2932	0.1645	0.075	-0.0300	0.6166
believe doctors discuss treatment before they decide **	0.0412	0.1489	0.782	-0.2514	0.3340
believe patients are reluctant to ask questions **	0.0895	0.1523	0.557	-0.2097	0.3889
believe doctors admit their mistakes **	0.0763	0.1992	0.702	-0.3151	0.4678
believe doctors use words patients find difficult to understand **	2.1058	0.7460	0.005	0.6397	3.5719
Interaction effect (age*doctors use difficult words)	-0.0312	0.0121	0.011	-0.0552	-0.0073
_cons	1.3169	0.7587	0.083	-0.1741	2.8080

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

Table B2.2: Interaction effect (tertiary education*doctors use difficult words)

	Coef.	Std. Err.	P>t	95% C.I.	
Demographic and socioeconomic factors					
sex (0=male 1=female)	-0.0534	0.1509	0.724	-0.3500	0.2431
age (years)	-0.0185	0.0059	0.002	-0.0303	-0.0068
education (0=primary education)					
secondary	-0.1856	0.1992	0.352	-0.5772	0.2060
tertiary	0.0694	0.2434	0.775	-0.4089	0.5479
feeling about household's income (0=living comfortable)					
coping at present income	-0.0009	0.1825	0.996	-0.3597	0.3578
difficult on present income	0.2974	0.2244	0.186	-0.1437	0.7385
very difficult on present income	0.0190	0.2961	0.949	-0.5629	0.6011
Health status					
health (0=(very good)					
fair	-0.0671	0.1848	0.717	-0.4303	0.2960
bad	-0.1856	0.2837	0.513	-0.7433	0.3719
hampered in daily activity (0=no 1=yes)	0.2588	0.1723	0.134	-0.0798	0.5974
Doctor-patient relationship					
believe illnesses cure themselves without visiting a doctor *	0.0811	0.2188	0.711	-0.3489	0.5111
believe people rely too much on doctors *	0.0291	0.1574	0.853	-0.2802	0.3386
believe when people sure of medicine doctor should prescribe *	-0.1769	0.1485	0.234	-0.4688	0.1148
believe it's best to follow doctor's advice *	-1.5036	0.4724	0.002	-2.4321	-0.5751
feel disappointed when leave without prescription *	-0.0182	0.2402	0.939	-0.4903	0.4537
believe doctors keep the whole truth **	0.3278	0.1616	0.043	0.0101	0.6455
believe doctors discuss treatment before they decide **	0.0260	0.1505	0.863	-0.2698	0.3219
believe patients are reluctant to ask questions **	0.1017	0.1534	0.508	-0.1998	0.4033
believe doctors admit their mistakes **	0.0412	0.1975	0.835	-0.3470	0.4294
believe doctors use words patients find difficult to understand **	0.4265	0.1792	0.018	0.0743	0.7787
Interaction effect (tertiary education*doctors use difficult words)	-0.4585	0.3316	0.168	-1.1103	0.1932
cons	1.7091	0.6557	0.009	0.4205	2.9977

* 0=not agree. 1=agree

** 0=no & to some extend. 1=yes

APPENDIX C
(Calculations for Model 3)

C.1 The indifference point, q^* .

The doctor will be indifferent in playing NT or T when $U_1 = U_2$. Replacing the payoffs this is equivalent to the following equations:

$$q \cdot [u_D(E[s]-l)-a]+(1-q)\cdot u_D(E[s]) = q\cdot(E[u_D(s)]-\varepsilon_2)+(1-q)\cdot[u_D(E[s]-l)-\varepsilon_1],$$

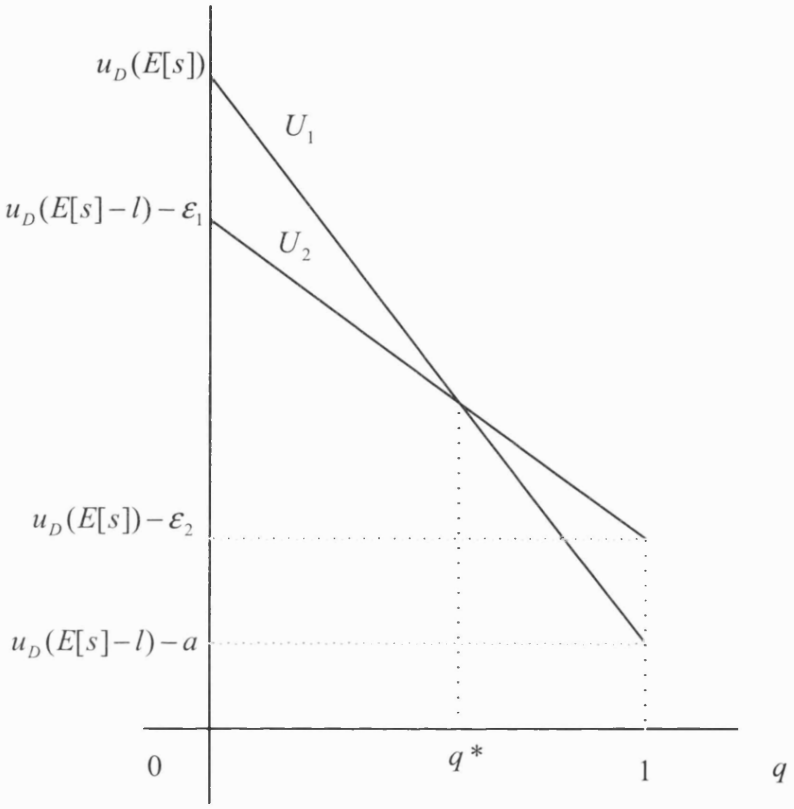
$$q\cdot u_D(E[s]-l)-q\cdot a+u_D(E[s])-q\cdot u_D(E[s]) = q\cdot E[u_D(s)]-q\cdot\varepsilon_2+u_D(E[s]-l)-\varepsilon_1-q\cdot u_D(E[s]-l)+q\cdot\varepsilon_1,$$

$$q\cdot[u_D(E[s]-l)-a-u_D(E[s])-E[u_D(s)]+\varepsilon_2+u_D(E[s]-l)-\varepsilon_1] = u_D(E[s]-l)-u_D(E[s]-l)-\varepsilon_1.$$

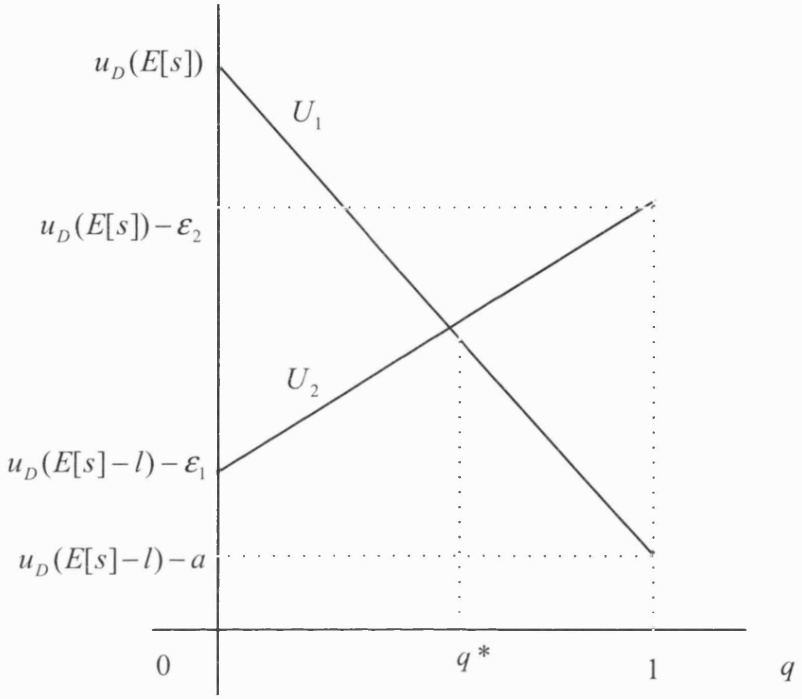
Recall that the doctor's utility function is linear therefore $E[u_D(s)] = u_D(E[s])$. This results to:

$$q^* = \frac{u_D(E[s])-u_D(E[s]-l)+\varepsilon_1}{2u_D(E[s])-2u_D(E[s]-l)+a+\varepsilon_1-\varepsilon_2}.$$

C.2 The functions U_1 and U_2.



(a) Case 1: $u_D(E[s]-l)-\varepsilon_1 > u_D(E[s])-\varepsilon_2$ or $\varepsilon_2 > \varepsilon_1 + l$.



(b) Case 2: $u_D(E[s]-l)-\varepsilon_1 < u_D(E[s])-\varepsilon_2$ or $\varepsilon_2 < \varepsilon_1 + l$.

C.3 Case 1: The doctor will play NT when $U_1 > U_2$.

Replacing the payoffs this is equivalent to the following equations:

$$q\cdot[u_D(E[s]-l)-a]+(1-q)\cdot u_D(E[s]) > q\cdot(E[u_D(s)]-\varepsilon_2)+(1-q)\cdot[u_D(E[s]-l)-\varepsilon_1],$$

$$q\cdot u_D(E[s]-l)-q\cdot a+u_D(E[s])-q\cdot u_D(E[s]) > q\cdot E[u_D(s)]-q\cdot\varepsilon_2+u_D(E[s]-l)-\varepsilon_1-q\cdot u_D(E[s]-l)+q\cdot\varepsilon_1,$$

$$q\cdot[u_D(E[s]-l)-a-u_D(E[s])-E[u_D(s)]+\varepsilon_2+u_D(E[s]-l)-\varepsilon_1] > u_D(E[s]-l)-u_D(E[s]-l)-\varepsilon_1,$$

$$q\cdot[u_D(E[s]-l)-a-u_D(E[s])-E[u_D(s)]+\varepsilon_2+u_D(E[s]-l)-\varepsilon_1] > u_D(E[s]-l)-u_D(E[s]-l)-\varepsilon_1.$$

Recall that the doctor's utility function is linear therefore $E[u_D(s)]=u_D(E[s])$. This results to:

$$q < \frac{u_D(E[s])-u_D(E[s]-l)+\varepsilon_1}{2u_D(E[s])-2u_D(E[s]-l)+a+\varepsilon_1-\varepsilon_2}.$$

Or:

$q < \frac{X}{X+Y}$, where:

$X = u_D(E[s]) - u_D(E[s]-l) + \varepsilon_1 > 0$ and

$Y = u_D(E[s]) - u_D(E[s]-l) + a - \varepsilon_2 > 0$.

Under bounded rationality $q = \frac{1}{2}$ therefore:

$$\frac{1}{2} < \frac{X}{X+Y} \quad \Leftrightarrow \quad X+Y < 2X \quad \Leftrightarrow \quad X > Y \quad \Leftrightarrow \quad \varepsilon_1 > a - \varepsilon_2 \quad \Leftrightarrow$$

$$\frac{1}{2}(\varepsilon_1 + \varepsilon_2) > \frac{1}{2}(a+0).$$

C.4 Case 2: The doctor will play T when $U_1 < U_2$.

Replacing the payoffs this is equivalent to following equations:

$$q \cdot [u_D(E[s]-l) - a] + (1-q) \cdot u_D(E[s]) < q \cdot (E[u_D(s)] - \varepsilon_2) + (1-q) \cdot [u_D(E[s]-l) - \varepsilon_1],$$

$$q \cdot u_D(E[s]-l) - q \cdot a + u_D(E[s]) - q \cdot u_D(E[s]) < q \cdot E[u_D(s)] - q \cdot \varepsilon_2 + u_D(E[s]-l) - \varepsilon_1 - q \cdot u_D(E[s]-l) + q \cdot \varepsilon_1,$$

$$q \cdot [u_D(E[s]-l) - a - u_D(E[s]) - E[u_D(s)] + \varepsilon_2 + u_D(E[s]-l) - \varepsilon_1] < u_D(E[s]-l) - u_D(E[s]-l) - \varepsilon_1,$$

$$q \cdot [u_D(E[s]-l) - a - u_D(E[s]) - E[u_D(s)] + \varepsilon_2 + u_D(E[s]-l) - \varepsilon_1] < u_D(E[s]-l) - u_D(E[s]-l) - \varepsilon_1 .$$

Recall that the doctor's utility function is linear therefore $E[u_D(s)] = u_D(E[s])$. That results to:

$$q > \frac{u_D(E[s]) - u_D(E[s]-l) + \varepsilon_1}{2u_D(E[s]) - 2u_D(E[s]-l) + a + \varepsilon_1 - \varepsilon_2}.$$

Or:

$q > \frac{X}{X+Y}$, where:

$X = u_D(E[s]) - u_D(E[s]-l) + \varepsilon_1 > 0$ and

$Y = u_D(E[s]) - u_D(E[s]-l) + a - \varepsilon_2 > 0.$

Under bounded rationality $q = \frac{1}{2}$ therefore:

$$\frac{1}{2} < \frac{X}{X+Y} \quad \Leftrightarrow \quad X+Y<2X \quad \Leftrightarrow \quad X>Y \quad \Leftrightarrow \quad \varepsilon_1 > a-\varepsilon_2 \quad \Leftrightarrow$$

$$\frac{1}{2}(\varepsilon_1+\varepsilon_2) > \frac{1}{2}(a+0).$$

C.5 Proposed empirical testing

We propose here a way of a possible further empirical testing of the theoretical model presented in this Chapter 6 of the thesis.

A questionnaire study could be used to examine patient's preferences for information and their doctors' perception of these preferences. Patients will complete a questionnaire before and after consultation with doctors. The doctors will complete at the beginning of the study and after each consultation with the participant patients. Before consultation, patients will be asked about preferences for information seeking. Doctors will be asked to estimate the patients' preferred level of information seeking after the consultation with the patient. Each patient's preference will then be compared with the doctor's estimate of the patient's preference to identify disconnections. After the consultation, the patient will be asked for overall satisfaction with the consultation and his/her intention to adhere to medical recommendations.

The pre-consultation questionnaire to be given to the patients will ask patient's preference for information seeking. A number of instruments has been validated and repeatedly been used to identify 'monitoring' and 'bluntering' preferences. The Miller Behavioral Style Scale (henceforth MBSS) is one of the most well known and most frequently used instruments developed by Miller, who introduced the concept of 'monitors' and 'blunters' (Miller, 1987). This scale asks the individual to imagine four stress-evoking scenes that are similar to context to the hospital situation (i.e. "Imagine that you are afraid of flying and have to go somewhere by plane"). Each of these statements is followed by eight alternatives that represent ways of coping with the situation. Four of these alternatives are of an information-seeking variety (i.e. "I would read and reread the safety instruction booklet") and four are of information-avoiding variety (i.e. "I would watch the in-flight

film even if I had seen it before"). The scale has been used in many studies and has been proven to have good predictive and discriminant validity (Miller et al., 1989).

Two scores are derived from the MBSS: a) the total monitoring score, which is the sum of monitoring options endorsed across the four situations (higher scores equals more monitoring) and b) the total blunting score, which is obtained by summing the number of blunting options (higher scores indicates more blunting). A single score can be computed by subtracting the total number of 'blunting' items endorsed from the total 'monitoring' items endorsed.

Questions regarding patient's age, sex and educational qualifications will also be included to test whether demographic characteristics are associated with information preferences.

The post-consultation questionnaire will ask patients about satisfaction with consultation and the information they have received, satisfaction with doctors and intention to adhere to the medication prescribed by the doctor. Satisfaction with the doctor can be assessed using the Medical Interview Satisfaction Scale that has been validated in previous studies.

Doctors will be given a questionnaire asking them a number of questions including, their perception of the patient's preference regarding information, their level of satisfaction with the consultation and the quality of their relationship with the patient.