Patient payments and health behaviors: stick or carrot?

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**PATIENT PAYMENTS AND HEALTH
BEHAVIORS:
STICK OR CARROT?**

Reza Rezayatmand

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by

Mohammadreza Rezayatmand

Promoter:

Prof. dr. Wim Groot

Co-promoter:

Dr. Milena Pavlova

Assessment Committee:

Prof. dr. Silvia Evers (chair)

Prof. dr. Henriëtte Maassen van den Brink

Prof. dr. Werner Brouwer (Erasmus University, Rotterdam)

Prof. dr. Dirk Ruwaard

Prof. dr. Nanne de Vries

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Chapter 1

General introduction

1.1 The scope of dissertation

Individuals who get insured tend to change their behavior in a way that drives up the insurer's costs. In health care, this phenomenon, known as moral hazard, can happen in two ways: first, individuals may take less precautionary action to prevent a health problem, if they know that the costs of medical treatment are covered by the insurer; second, they may seek medical care sooner and more frequently, since full health insurance coverage removes the financial barrier. Full insurance could, in theory, be a disincentive for prevention (i.e. ex-ante moral hazard) and an incentive for overconsumption of medical services (i.e. ex-post moral hazard) (Zweifel & Manning, 2000).

Out-of-pocket payments are seen as an efficiency improving tool that is expected to discourage ex-post moral hazard on the side of the health care consumers and to reduce unnecessary use of health care services (Kim, Ko, & Yang, 2005). Empirical evidence suggests that these payments reduce the utilization of health care services, and thus may not only increase efficiency by reducing overconsumption of unnecessary medical care, but also affect equity and quality of health care provision (James et al., 2006; Lagarde & Palmer, 2008; Szende & Culyer, 2006). However, out-of-pocket payments might also have an undesired effect on the demand for necessary medical services such as preventive services (e.g. vaccination, screening) (Swartz, 2010). Moreover, the use of some preventive services (e.g. screening) is only worthy if they can be followed by timely medical treatment. Thus, out-of-pocket payments for curative care that might follow the preventive care can act as a barrier to keep use of preventive services at a recommended level. Hence, out-of-pocket payments are sometimes described as a blunt tool (Baicker & Goldman, 2011).

At the same time, out-of-pocket payments are expected to encourage healthy behavior by discouraging ex-ante moral hazard (Zweifel & Manning, 2000). For instance, out-of-pocket payments increase the costs of medical care that result from unhealthy behavior, thus they may provide incentives for a healthier lifestyle. In this view, the potential impact of out-of-pocket payments on health behavior differs from their effects on the use of preventive services. On the one hand, out-of-pocket payments when addressing ex-ante moral hazard have the potential to prompt a healthier lifestyle. On the other hand, when addressing ex-post moral hazard, they have the potential to decrease the use of preventive services. Thus, the former side concerns a tradeoff between out-of-pocket payments and unhealthy

behaviors, while the latter concerns a tradeoff between out-of-pocket payments and use of preventive services.

Although ex-ante moral hazard has extensively been discussed theoretically, its application to health insurance market is not yet empirically well known (Zweifel, Breyer, & Kifmann, 2009). Hitherto, most empirical studies have looked at the effect of out-of-pocket payments on the demand for preventive services from the perspective of ex-post moral hazard rather than ex-ante moral hazard (Courbage & Coulon, 2004). They mainly show that a higher level of coverage both for curative and preventive care leads to an increase in the use of preventive services. In order to test the existence of ex-ante moral hazard, preventive activities that are not insured should be considered. Health behaviors such as non-smoking and physical activity are preventive activities that can serve this purpose very well. Smoking, excessive alcohol consumption, and physical inactivity are well known risk factors of, among others, cardiovascular disease, stroke, and cancer. Thus, not engaging in those unhealthy behaviors is widely considered as prevention. At the same time, this type of prevention is usually not covered by health insurance. Thus, should ex-ante moral hazard exist, full insurance coverage paves the way for engaging in unhealthy behaviors which might be individually but not socially optimal behavior. In this case, out-of-pocket payments may provide incentives for a more socially optimal behavior.

To study ex-ante moral hazard, one difficulty is to empirically distinguish the effect of ex-ante moral hazard from adverse selection (Powell & Goldman, 2013). Adverse selection means that individuals with a higher (perceived) health risk tend to purchase more health insurance or a more extensive coverage. In other words, a correlation between health insurance and prevention can be viewed either from the perspective of ex-ante moral hazard or adverse selection. For instance, it is possible that having health insurance provides incentives for individuals to smoke. At the same time, it is also possible that smoking motivates individual to buy health insurance or a more extensive coverage. The difficulties in separating adverse selection and ex-ante moral hazard are well-known (Powell & Goldman, 2013). Nevertheless, most studies on adverse selection are correlational studies that cannot isolate its effect from ex-ante moral hazard (Barrett & Conlon, 2003; Doiron, Jones, & Savage, 2008; Hopkins & Kidd, 1996).

This dissertation focuses on how and to what extent health insurance coverage is associated with having or not having a healthy lifestyle, and engaging in prevention activities. However, instead of health insurance coverage, the term 'health care cost coverage' is sometimes used to represent both coverage provided

by private insurance and social insurance. This dissertation provides insights on the possible directions of the relationship between health care cost coverage and health behavior as well as on the tradeoffs between out-of-pocket payments, health behavior and prevention.

In addition to providing empirical evidence on the ongoing theoretical discussion about moral hazard and adverse selection, this dissertation has policy relevance as well. Among policymakers worldwide there is a consensus on the urgent need to promote prevention through lifestyle changes. The General assembly of the United Nations (2011) has argued for “strengthening the capacity of individual and population to make healthier choice and follow a lifestyle pattern which fosters good health” (UN, 2011, p.5). At the same time, the aim of ‘universal health coverage’, stated by the WHO, requires the “full access to high-quality services for prevention, treatment and financial risk protection” (WHO 2013). Thus, should ex-ante moral hazard exist, these two objectives, i.e. prevention and universal health coverage, which are on the top of the policy agenda for health improvements, are conflicting. Full protection for financial risks, as suggested by universal health coverage, weakens rather than strengthens the capacity of individuals to make healthier choices.

Apart from that, universal health care cost coverage in most countries, where applicable, is publicly financed either by means of taxes, where there is a national health system, or by means of social health insurance premiums, where there is a social health insurance system. As a result, the cost burden of unhealthy behavior is incurred by all contributors to the health system funding, and not only by those who engage in unhealthy behaviors. With increased health care spending (especially because of the prevalence of non-communicable disease), there are those who advocate shifting more of the costs to the demand side by introducing more out-of-pocket payments, especially for health care services that would not be used should individuals behave in a healthier manner (Blacksher, 2008; Schmidt, Voigt, & Wikler, 2010). By exploring the tradeoff between out-of-pocket payments and prevention, this dissertation provides evidence that can help policymakers to make more informed decisions based on widely accepted principles of solidarity, equity, access, and freedom of choice.

1.2 Economics of health behavior and prevention

In Grossman’s (2000) seminal work, prevention is described as an investment in health capital which reflects the idea of ‘wellness’ in the field of public health. In

this model, each individual is given an endowment of health capital at birth, which depreciates with age but can be increased by investments. Consistent with Becker's model of household production, people combine their time with market goods to produce health to maximize their utility (Cawley & Ruhm, 2012). At the same time, enhancing their health capital stock can be considered an investment decision because it increases the amount of healthy time available for market and non-market production. However, the basic model of Grossman cannot make a useful distinction between preventive and curative care. For those who have already experienced losses in their health capital, curative care can also be considered as an investment in health capital (Kenkel, 2000).

It is argued that the decision to invest in health capital through prevention can be affected by the presence of market insurance. In the Ehrlich and Becker's model of health insurance, prevention is an ex-ante activity to reduce the probability or vulnerability of a bad state of nature. The former is called self-protection while the latter is called self-insurance (Ehrlich & Becker, 1972). Applied to health, self-protection refers to primary prevention, while self-insurance corresponds to secondary prevention. According to the health insurance model, prevention can be substituted by purchasing health insurance. Should market insurance exist; the insured individual has less incentive to invest in prevention. The insurance model provides additional insights into the interactions between insurance coverage for curative care and the demand for prevention. For instance, if an increase in the price of curative medical care increases the demand for prevention, it means that curative care and prevention are substitutes. However, if a decrease in the price of curative medical care increases the demand for prevention, it means that curative care and prevention are complements (Kenkel, 2000). Thus, as mentioned earlier, the relationship between insurance and prevention can be discussed in the form of two tradeoffs; a tradeoff between out-of-pocket payments (i.e. partial insurance coverage) and unhealthy behavior, and a tradeoff between out-of-pocket payments and the use of preventive services.

1.3 Tradeoffs

1.3.1 Tradeoff between out-of-pocket payments and unhealthy behavior

In the terminology of Ehrlich and Becker (1972), ex-ante moral hazard occurs if the purchase of market insurance decreases the demand for self-protection. The term ex-ante is used because the effect of insurance on the level of prevention is when the health status of the individual is still unknown. As already mentioned, the other

type of moral hazard is ex-post moral hazard, which shows that the financial loss or the cost of treatment in case of health insurance is related to the insurance. The occurrence of ex-ante moral hazard depends on the type of insurance premium. If the premium is risk related, it might provide enough incentive for the individual to invest in prevention. In most cases, ex-ante moral hazard stems from information asymmetry between the insurer and the insured individual, as the insurer cannot observe the level of self-protection.

While ex-post moral hazard has received a lot of attention in research area, ex-ante moral hazard has rarely been tested empirically (Zweifel et al., 2009). Thus, despite these theoretical notions, the empirical evidence about the existence of ex-ante moral hazard is meager and non-conclusive. One study, using data from the 1990 US National Health Interview Survey, investigated the effect of health insurance on the odds of sedentary lifestyle, obesity, smoking, heavy drinking, and some preventive services for women (Kenkel, 2000). This study provided little evidence on the existence of ex-ante moral hazard as it showed that health insurance led to healthier choices with the exception that insured men were more likely to be obese. These results can be explained by unobserved individual heterogeneity in risk aversion. Risk avoiders are more likely to avoid unhealthy behavior and at the same time seek more financial security by purchasing health insurance. Accordingly, the study by Barsky, Juster, Kimball, and Shapiro (1997) shows that risk tolerance is a significant predictor of smoking, drinking, as well as of failing to have insurance. Another explanation for the positive relation between health insurance and healthier choices reported by Kenkel (2000) is that health insurance can at best only compensate the financial losses caused by diseases and not all suffering they place on patients if the illness occurs. No one prefers to get ill even if he does not bear the financial consequence of illness.

The extent of ex-ante moral hazard also depends on the type of health care system, i.e. whether it is publicly or privately funded. The health care system can be categorized in three types: type I, private financing and delivery, type II, public financing and substantial private delivery, and type III, public financing and delivery (Besley & Gouveia, 1994). In the first type, private insurance can set a risk-rated premium to decrease the extent of moral hazard. Also, private insurance may provide enough incentives to invest in prevention at least to the extent that marginal costs of prevention equal its marginal benefits. In the type II system, even though the public sector may encourage investing in prevention, how to incentivize the agent in the private sector to do this is really challenging. This problem exists also in the type III where despite a general incentive at national level, it is difficult

to provide incentives to those agents who are directly involved in providing prevention (Kenkel, 2000).

The health care system in the US is a concrete example of a privately funded system where more value is attached to freedom of choice and individual responsibility. However, the health care systems in most European countries are good examples of publicly financed systems where universal health care coverage is considered as a socially valued principle. As a result, it is expected that ex-ante moral hazard should be a larger problem in these countries compared to US. At the same time, a lower prevalence of tobacco consumption and alcohol consumption is observed in the US than in most European countries (Figure 1.1), although in many European countries the tax on cigarette and alcohol are set much higher than in the US. In contrast, the prevalence of obesity in the US far exceeds the prevalence of obesity in European countries (Figure 1.1).

Nevertheless, it is not still empirically well known how these differences can be attributed to different types of health care systems and what their effects are on the extent of ex-ante moral hazard. Most evidence on the extent of ex-ante moral hazard comes from the US (Dave & Kaestner, 2009; Stanciole, 2008), and evidence from European countries is lacking (Courbage & Coulon, 2004). However, results from the US are not necessarily applicable to Europe. Since the past decade, there has also been a tendency in Europe to incorporate market mechanisms in the health care system (Maarse, 2006). Hence, it is highly relevant to study to what extent ex-ante moral hazard exists in European health care systems.

Several market solutions to ex-ante moral hazard have been discussed in the literature; namely risk-rated premiums, investment in prevention by insurers, and incomplete insurance coverage (Kenkel, 2000). Risk-rated premiums are not always feasible, because the level of prevention cannot be easily understood from the behavior of the insured. In addition, it is often prohibited because it contradicts the basic principles of solidarity and equity in the health care system. Also, insurers are not so willing to invest in prevention because of enrollment uncertainty. However, incomplete insurance coverage has often been used to encourage self-protection. Nevertheless, incomplete coverage reflected in more out-of-pocket payments might also have an opposite effect on the level of prevention (Swartz, 2010).

Source: OECD Health Statistics 2013

Figure 1.1 *Prevalence of unhealthy behaviors in 2011 (or nearest year)*

1.3.2 Trade-off between out-of-pocket payments and the use of preventive services

As mentioned earlier, curative care and prevention could be complements. Thus, a decrease in the price of curative medical care increases the demand for prevention. Kenkel (1994) shows that coverage for curative care has a positive impact on the use of two preventive services i.e. breast and cervical cancer screening. This is explained by the fact that early detection of these diseases is valuable only if it can

be followed by early curative care. However, if due to high out-of-pocket cost, curative care is prohibitively expensive, early detection, through the use of preventive services, is worthless. The notion that prevention and cure may be complements instead of substitutes is specific to secondary preventive services and will not generally apply to primary prevention (Kenkel, 2000).

Regardless of out-of-pocket payments for curative care, there might also be a tradeoff between preventive care and out-of-pocket payments for those services. For instance, regardless of the insurance coverage for the treatment of breast cancer, out-of-pocket payments for a mammogram lead to less utilization of this service. However, this effect can be explained by the effect of out-of-pocket payments, in general, on utilization of medical services, which is more in line with ex-post moral hazard. This effect might be desirable in case of curative care but is not always desirable for preventive care, because it leads to less prevention. Thus, to keep the use of preventive services at the recommended level, especially for preventive services such as vaccination which generate positive externalities, they are provided free of charge (Sepehri & Chernomas, 2001).

1.4 Health behavior

Primary prevention (self-protection) includes among other things health behaviors that can be broadly defined as any action or inaction that affects one individual's health. This dissertation focuses on health behavior as it is relevant to both theory and practice. First, from a theoretical point of view, in order to truly examine ex-ante moral hazard, some uninsured preventive activities should be considered. As mentioned earlier, health behaviors such as not smoking and exercise can serve this purpose very well. It is estimated that up to 80% of heart disease, stroke, and type II diabetes are preventable by lifestyle changes regarding smoking, alcohol consumption, diet and, exercise (WHO, 2011). Thus, due to raising public awareness about the danger of these behaviors, they are widely perceived as a health risk, and not engaging in these behaviors is widely accepted as a preventive activity. Second, from a policy point of view, lifestyle change has become the focus of attention of the highest policymaking echelon for health in the world. Thus, gaining more insight on any factors that have the potential to affect individuals' capacity to follow a healthier lifestyle is of important relevance to policy. As noted earlier, out-of-pocket payments, theoretically, have the potential to promote healthy behavior. Thus, it is worthwhile to explore to what extent this potential effect can be put in practice.

In this dissertation, we focus on smoking, alcohol use, physical inactivity, and obesity or overweight. As depicted in Table 1.1, they are among the top leading risk factor causes of mortality and morbidity worldwide. Nearly 23% of all deaths and 13% of all DALYs in the world is attributable to smoking, alcohol use, physical inactivity, and obesity or overweight. In high income countries, they cause even more mortality and morbidity, being responsible for 36% of all deaths, and 28% of all DALYs. As a result, during the time that all countries are grappling with the rising costs of health care, these behaviors are considered as one of the important forces which drive spending growth in health care, particularly in high income countries. Thus, having assumed the potential discouraging effect of out-of-pocket payments on unhealthy behavior, they can be very attractive tool for several reasons: first, they can encourage a healthier lifestyle by increasing the cost of an unhealthy lifestyle; second they bring extra revenues to the health care system while containing the cost; third, they provide a more fair financing system for those who behave with propriety. Hence, it is of important interest to explore how and to what extent out-of-pocket payments are associated with a healthy lifestyle.

Table 1.1 *The 10 leading risk factor causes of mortality and morbidity, 2004*

Mortality							
World				High income countries ¹			
	<i>Risk factor</i>	<i>Deaths (millions)</i>	<i>% of total</i>		<i>Risk factor</i>	<i>Deaths (millions)</i>	<i>% of total</i>
1	High blood pressure	7.5	12.8	1	Tobacco use	1.5	17.9
2	Tobacco use	5.1	8.7	2	High blood pressure	1.4	16.8
3	High blood glucose	3.4	5.8	3	overweigh and obesity	0.7	8.4
4	Physical inactivity	3.2	5.5	4	physical inactivity	0.6	7.7
5	Overweight and obesity	2.8	4.8	5	High blood glucose	0.6	7.0
6	High cholesterol	2.6	4.5	6	High cholesterol	0.5	5.8
7	Unsafe sex	2.4	4.0	7	low fruit and vegetable intake	0.2	2.5
8	Alcohol use	2.3	3.8	8	Urban outdoor air pollution	0.2	2.5
9	Childhood underweight	2.2	3.8	9	alcohol use	0.1	1.6
10	Indoor smoke from sold fuels	2.0	3.3	10	Occupational risks	0.1	1.1
Morbidity							
World				High income countries ¹			
	<i>Risk factor</i>	<i>DALYs (millions)</i>	<i>% of total</i>		<i>Risk factor</i>	<i>DALYs (millions)</i>	<i>% of total</i>
1	Childhood underweight	91	5.9	1	Tobacco use	13	10.7
2	Unsafe sex	70	4.6	2	Alcohol use	8	6.7
3	Alcohol use	69	4.5	3	Overweight and obesity	8	6.5
4	Unsafe water, sanitation, hygiene	64	4.2	4	High blood pressure	7	6.1
5	High blood pressure	57	3.7	5	High blood glucose	6	4.9
6	Tobacco use	57	3.7	6	Physical inactivity	5	4.1
7	Suboptimal breastfeeding	44	2.9	7	High cholesterol	4	3.4
8	High blood glucose	41	2.7	8	Illicit drug	3	2.1
9	Indoor smoke from solid fuels	41	2.7	9	Occupational risks	2	1.5
10	Overweight and obesity	36	2.3	10	Low fruit and vegetable intake	2	1.3

¹Gross national income per capita of US \$ 10 066 or more

Source: adapted from WHO global health risks 2009

1.5 Aim and objectives

As outlined in this introductory chapter, despite much theoretical discussion about tradeoffs between health insurance and prevention, there appears to be little empirical evidence on the topic. Most studies have examined the effect of insurance coverage on the utilization of preventive services, addressing ex-post moral hazard rather than ex-ante moral hazard. In addition, existing studies have not taken account for the bidirectional nature of the relationship between insurance and prevention. Thus, considering all these caveats, the overall aim of this dissertation is to study how and to what extent health-related behaviors and health care cost coverage are related. To achieve the aim of the dissertation, the following research objectives are defined:

1. To review existing evidence about the impact of health care cost coverage on health-related behavior
2. To empirically test the impact of health care cost coverage on health-related behavior (moral hazard perspective)
3. To empirically test the impact of health-related behavior on health care-cost coverage (adverse selection perspective)
4. To study the amount of out-of-pocket payments among those who engaged in unhealthy behavior

The first research objective is addressed by a systematic literature review. Appropriate quantitative data analyses are employed on an existing dataset to address the other research questions. For this purpose, we use data from the Survey of Health, Aging, and Retirement in Europe (SHARE). Although SHARE only include individuals aged 50 and over, still can be used to test our research objectives. Regarding the theory of ex-ante moral hazard, this data limitation does not affect our conclusion as we want to find evidence for the presence of ex-ante moral hazard. In addition, health behaviors are even more important at older age, because the health consequences of unhealthy behaviors at those ages are more serious which requires quicker actions (Chiuve, McCullough, Sacks, & Rimm, 2006; Chiuve et al., 2008; Haveman-Nies, de Groot, & van Staveren, 2003).

1.6 Dataset

As mentioned previously, the empirical analysis in this dissertation is based on the SHARE dataset. SHARE is the European longitudinal aging survey which provides micro data on health, socioeconomic status and social and family networks of more

than 85000 individuals aged 50 or over from 19 European countries (Malter & Borsch-Supan, 2013). It is similar to the US Health and Retirement Study (HRS) and the English Longitudinal Study of Aging (ELSA). Data are collected via a face-to-face, computer-aided personal interviews (CAPI), supplemented by self-completion paper and pencil questionnaires. The main SHARE questionnaire in the base line survey (first wave) consists of 20 modules on health, socio-economic and social network (Borsch-Supan & Jurges, 2005). The second wave consists of 22 modules. Since wave 2, an end-of-life module has been added about death reasons and circumstances (Borsch-Supan et al., 2008).

The base line SHARE data collection was conducted in 2004 in 11 European countries. They represent various regions in Europe ranging from Scandinavia (Denmark and Sweden) through Western and Central Europe (Austria, France, Germany, Switzerland, Belgium, and the Netherlands) to the Mediterranean (Spain, Italy and Greece). The survey is planned to be conducted every two years (Borsch-Supan & Jurges, 2005). The Czech Republic and Poland as well as Ireland joined SHARE in 2006 and participated in the second wave of data collection in 2006-2007. By the second wave, SHARE started its longitudinal dimensions (Borsch-Supan et al., 2008).

The third wave of SHARE the so-called SHARELIFE focuses on people's life histories. It contains data of 30000 individuals from 13 European countries. SHARELIFE links individual micro data over the respondents' entire life with institutional macro data on the welfare state. It thereby allows assessing the full effect of welfare state interventions on the life of the individual. The SHARELIFE questionnaire covers all important areas of respondents' lives, ranging from partners and children over housing and work history to detailed questions on health and health care. The data collection for SHARELIFE took place in 2008-2009 (Schroder, 2011).

The fourth wave of SHARE, which is the third regular panel wave of the survey following the SHARELIFE life history questionnaire, took place in 2010. Estonia, Hungary, Portugal and Slovenia joined SHARE Wave 4 (Malter & Borsch-Supan, 2013). The fieldwork of the fifth wave of SHARE was completed in November 2013, and data are to be released in the summer of 2014 (SHARE, 2014).

SHARE devotes a section of the questionnaire on health-related behaviors where respondents are asked about smoking, alcohol consumption and the level of physical activity. A more detailed description of the data can be found on the official website of the survey (<http://www.share-project.org/>). The wording of the

questions used in this dissertation, can be found in Appendix A. In this dissertation, the data from the first two waves of SHARE (release 2.5.0) are used.

1.7 Outline of the dissertation

The dissertation is divided in six chapters (including this general introduction). The next four chapters address the objectives defined in this chapter. The final chapter provides a general discussion about the topic of this dissertation. The chapters are subsequently outlined.

In **Chapter 2**, we systematically review empirical evidence on the effects of out-of-pocket payments on the use of preventive services and health-related lifestyle. All possible combinations of three key words ‘prevention’, ‘patient payment’ and ‘health-related behavior’ are used for the search in PUBMED, ECONLITH, ECONPAPER and EMBASE. In total, 47 publications are identified as relevant. The chapter provides a summary of the results of these publications in the form of tables and two schematic figures.

In **Chapter 3**, we use data from SHARE for the Netherlands in 2004 and 2007 (before and after the health insurance reform in the country) to explore factors associated with the state and dynamics of health-related behavior. For this purpose, logit and multinomial models are used to study daily smoking, excessive alcohol use and physical inactivity in 2004 and their corresponding changes (stopping or starting unhealthy behavior) between 2004 and 2007. All models include a comprehensive set of explanatory factors (i.e. socioeconomic, health status, and health insurance status).

In **Chapter 4**, we use data from the second wave of SHARE for 12 European countries. An instrumental variable strategy is used to examine the causal effect of daily smoking on health care cost coverage of those at age 50 or above in the European countries studied. Daily smoking is instrumented by a variable indicating whether or not there is any other daily smoker in the household. For health care cost coverage, a generated variable indicating the individuals’ self-assessed health cost coverage is used.

In **Chapter 5**, we address two questions: whether or not an unhealthy lifestyle is associated with more utilization of health care and whether the extra cost of more health care used is paid out of the pocket by those who engage in unhealthy behavior (i.e. smoking, alcohol consumption, and obesity). The study uses data from the second wave of SHARE for 13 European countries. A sequential logit model is used to analyze the use and payments for outpatient and

inpatient health care service in addition to a two part model for the analysis of the use and payments for prescribed drugs.

Finally, **Chapter 6** is devoted to the general discussion of the research results. In this chapter, we summarize and discuss the main findings following the research aims of the dissertation. The chapter also outlines the policy implications of the results, as well as prospects for further research.

Chapter 2

The impact of out-of-pocket payments on prevention and health-related lifestyle: a systematic literature review

This chapter draws upon:

Rezayatmand, R., Pavlova, M. and Groot, W. (2013). The impact of out-of-pocket payments on prevention and health-related lifestyle: a systematic literature review. *The European Journal of Public Health*, 23(1), 74-79.

Abstract

Out-of-pocket payments can have a large impact on the demand for health care. They can be essential not only to decrease unnecessary service use, but also to encourage the use of particular preventive services provided free of charge or at a lower price. Moreover, out-of-pocket payments may increase the costs of unhealthy behavior and provide incentives for a healthier lifestyle.

This chapter systematically reviews empirical evidence on the effects of out-of-pocket payments on the use of preventive services and health-related lifestyle. All possible combinations of three key words “prevention”, “patient payment” and “health-related behavior” are used for the search in PUBMED, ECONLITH, ECONPAPER and EMBASE. In total, 47 relevant publications are identified.

The results suggest that out-of-pocket payments can create a financial barrier and can decrease the use of preventive services and the uptake of preventive medications. A few studies (with contradicting empirical evidence) address the impact of cost-sharing and reduced insurance coverage on a healthier lifestyle.

Although the great diversity of study designs (various indicators of out-of-pocket payments and preventive/health-related behavior) makes it difficult to offer robust policy recommendations, our findings support calls to reconsider how preventive services should be financed. More research is needed to explore the actual impact of cost-sharing on different aspects of health-related lifestyles, as well as to explain the role of other relevant determinants that could impact this relationship.

2.1 Introduction

Out-of-pocket payments have received a lot of attention in recent years due to their effect on patient behavior. They can have an impact on the quantity of health care demanded. Patient payments can decrease unnecessary service utilization, but also encourage the use of specific preventive services (Fendrick, Smith, Chernew, & Shah, 2001). Moreover, out-of-pocket payments for curative care can increase the costs of unhealthy behavior for patients and may provide incentives for prevention (including vaccination, screening) and a healthier lifestyle (as outlined in Chapter 1).

Prevention is an *ex-ante* activity aimed at self-protection and self-insurance, and includes primary and secondary prevention (Courbage & Coulon, 2004). Primary prevention reduces the probability of illness by adapting patients' health-related behavior (e.g. health promotion or 'wellness' activities) (Barigozzi, 2004), and by providing health care services that might decrease the future incidence of illness (e.g. vaccination) (Kenkel, 2000). Secondary prevention decreases the vulnerability to an illness by means of medical interventions i.e. examination and/or medication, as well as diagnostic screening (e.g. scanning and mammography) (Barigozzi, 2004).

In the insurance model, as previously noted in Chapter 1, it is argued that primary prevention and cure are substitutes and thus, the increase in the price of curative medical care leads to an increase in the demand for primary prevention (Kenkel, 2000). This situation is related to *ex-ante* moral hazard, which is defined as the possibility that the insurance for curative care discourages primary prevention (Courbage & Coulon, 2004). Incomplete health insurance coverage by induced cost-sharing is one of the solutions (Kenkel, 2000). At the same time, it is suggested that insurance coverage for curative care may encourage the use of secondary preventive services designed for early detection of a disease. Thus, secondary prevention and cure may be complements rather than substitutes because early detection is valuable only if it can be followed by curative care (Kenkel, 2000). Despite much theoretical discussion, little is known about the applicability of the model in reality and how out-of-pocket payments can impact prevention and health-related lifestyle.

The aim of this chapter is to systematically review existing empirical evidence on the effects of out-of-pocket payments on the use of preventive services and health-related lifestyle. The chapter focuses on out-of-pocket payments that result from direct payments and cost-sharing arrangements.

2.2 Methods

Three key words were selected for systematic literature review namely ‘prevention’, ‘health-related behavior’ and ‘patient payment’. By patient payment we mean a direct payment for health care goods or services that are not covered by any form of pre-payment scheme or a payment resulting from cost-sharing arrangements that require patients to pay part of their health care costs.

Possible synonyms of all terms were also included, as well as their different spelling. As a result, several chains of keywords were used for the literature search (see Box 2.1). Using these chains of key words presented in Box 2.1, the following databases were searched: PUBMED, ECONLITH, ECONPAPER and EMBASE. To keep the search feasible, only the titles and the abstracts of the publications were searched. In fact, if the text of the publication was also included in the search, then, the list of publications would contain a huge number of irrelevant publications. There was no limitation to the year of publication and geographical region. However, only English language publications were included. This way, the initial list of publications was obtained.

After excluding duplicate publications, the list was reduced by applying relevance criteria, namely the publication should present an empirical analysis that directly or indirectly indicated the effect of out-of-pocket payments on the use of preventive services and/or health-related lifestyle. In order to identify relevant articles, first, all abstracts were reviewed. If the relevance of the publication was uncertain, the full text was reviewed. The reference lists of the publications were also reviewed. This way, the final list of relevant publications was obtained. Publications selected as relevant were reviewed to extract empirical evidence about the relationship between out-of-pocket payments and prevention/health-related lifestyle. Evidence was categorized in the form of tables and figures, and was analyzed qualitatively in line with the aim of the chapter.

Box 2.1 *Chain of keywords used in the literature search*

- 1) PREVENTIVE HEALTH SERVICES or CLINICAL PREVENTIVE SERVICES or PREVENTION and [PATIENT PAYMENT or PATIENT PAYMENTS or USER FEE or USE FEES or USER CHARGE or USER CHARGES or COST SHARING or COST-SHARING or COINSURANCE or CO-INSURANCE or DEDUCTIBLE or COPAYMENT or COPAYMENTS or CO-PAYMENT or CO-PAYMENTS or OUT OF POCKET PAYMENT or OUT OF POCKET PAYMENTS or OUT-OF –POCKET PAYMENT or OUT-OF-POCKET PAYMENTS].

- 2) HEALTH BEHAVIOR or HEALTHY BEHAVIOR or HEALTH RELATED BEHAVIOR or HEALTH RELATED LIFESTYLE or HEALTH LIFESTYLE or HEALTHY LIFESTYLE and [PATIENT PAYMENT or PATIENT PAYMENTS or USER FEE or USE FEES or USER CHARGE or USER CHARGES or COST SHARING or COST-SHARING or COINSURANCE or CO-INSURANCE or DEDUCTIBLE or COPAYMENT or COPAYMENTS or CO-PAYMENT or CO-PAYMENTS or OUT OF POCKET PAYMENT or OUT OF POCKET PAYMENTS or OUT-OF –POCKET PAYMENT or OUT-OF-POCKET PAYMENTS].

2.3 Result

In total, 188 articles were initially identified, of which 47 met the relevance criteria. A list with all publications reviewed can be found in Appendix B, and a detailed description of findings per publication can be found in Appendix C.

2.3.1 Overall characteristics of publications

Most studies, 31 out of 47 publications, originate from the US, and only two studies originate from Europe (one from Germany and one from UK). Most studies (90%) were published in peer-reviewed journals, although working papers and briefs are also included. While 82% of publications were published in the past decade (since 2000), 51% were published during the past six years. The majority of publications are based on existing data (e.g. claim and administrative data) and secondary data analysis, and/or simulation and econometric modeling. Only six studies collected their own data through surveys and three studies produced data by experiments. The internal validity of five studies is not clear because they do not discuss this issue and do not provide sufficient details to judge the internal validity. The external validity of only six studies is clear (mostly only at national level) due to the fact that the most of studies either do not discuss the generalizability of their results or express some doubts about it.

With regard to the type of prevention, 37 out of 47 publications aim at an analysis of secondary prevention. Most of these studies investigate the impact of prescription drugs cost-sharing on drug compliance and adherence. Among the most frequently addressed diseases are heart disorders (mostly coronary artery disease), hypertension, HIV infection and diabetes mellitus. Only six studies focus on the impact of cost-sharing on the demand for recommended preventive services, such as periodic comprehensive examination, cancer screening (mostly breast and cervical cancer), as well as blood pressure and cholesterol level screening. Only 13 publications focus on primary prevention and healthy behavior.

2.3.2 The impact of out-of-pocket payments on healthy behavior and primary prevention

Figure 2.1 illustrates the results of publications that study the impact of out-of-pocket payments on the use of preventive services and health-related activities. As illustrated in Figure 2.1, copayments have a negative impact on the number of patients with unhealthy behavior who are referred to intensive counseling (Krist et al., 2010). When patients are required to pay for counseling, the referral level declines by 97%. The type of the health insurance plan is also found to influence health-related behavior. For example, individuals who are enrolled in Consumer-Driven Health Plans (e.g. Health Saving Account which can be used to pay for health care expenses) and High Deductible Health Plans, are more cost conscious about health care expenditure and are more likely to exhibit healthy behavior (more

likely to exercise, less likely to smoke and less likely to be obese) than those with a traditional insurance coverage. This is because such plans bring an aspect of consumer engagement into the payment for health care (Fronstin, 2009).

One study (Courbage & Coulon, 2004), which examines whether purchasing private health insurance modifies the probability to exercise and smoke, finds that privately insured people tend to practice sports more often and smoke less than those who do not have a supplementary private health insurance. The study controls for socioeconomic (age, gender, education and income) and health condition variables. In addition, this study uses an instrumental variable technique to rule out the effect of a potentially important unobserved variable namely 'risk aversion'. Finally, it concludes that a health care market with widespread insurance coverage may lead to more (rather than less) prevention than a market with low insurance coverage. Another study (Schneider & Zerth, 2011), in contrast, shows that not having any type of insurance (supplementary and private insurance besides socioeconomic variables included as covariates), is positively associated with the probability to quit smoking. In addition, there is no significant evidence indicating that health insurance coverage for smoking cessation medicines encourages insured to quit smoking (Boyle, Solberg, Magnan, Davidson, & Alesci, 2002).

With regard to primary prevention, one study (Cherkin, Grothaus, & Wagner, 1990) shows that a copayment of \$5 for an office visit does not have any significant impact on childhood immunization. A Health Insurance Experiment study (HIE) (Lurie et al., 1987) that included significant numbers of low-income persons, by contrast, indicates that a cost-sharing insurance plan versus a free-of-charge insurance plan significantly decreases the percentage of children between 0 and 6 years who received any kind of immunization. In addition, some studies provide evidence indicating that the demand for preventive health products is highly price sensitive (Ashraf, Berry, & Shapiro, 2007; Harvey, 1994).

2.3.3 The impact of out-of-pocket payments on secondary prevention

In order to investigate the impact of cost-sharing on secondary prevention, the various outcome variables, addressed in the publications reviewed, are classified into two main groups – medication adherence and preventive services use.

Figure 2.1 *The impact of out-of-pocket payments on health-related behavior and primary prevention*

As depicted in Figure 2.2, there is strong evidence that prescription drug cost-sharing in terms of copayments or coinsurance, as well as different types of health insurance plans, negatively affect medication adherence, which might have adverse health consequences. Only three out of 31 studies contradict these findings (Cherkin et al., 1990; R. E. Johnson, Goodman, Hornbrook, & Eldredge, 1997; Pilote, Beck, Richard, & Eisenberg, 2002). In particular, one study (Pilote et al., 2002) reports that introducing a 25% coinsurance (by an annual ceiling based on personal income) does not change the prescription of essential cardiac medications and does not have consequences for care related to an acute myocardial infarction among elderly patients. Another study (R. E. Johnson et al., 1997) describes that a small change in copayment and coinsurance does not appear to substantially affect the outcome, while emphasizing that the impact of a large change in the copayment needs further examination. One of the publications (Cherkin et al., 1990) that studies the impact of a \$ 5 copayment for office visits, shows a 4% decrease in prescriptions for cardiovascular drugs, but this effect is not statistically significant.

There is also evidence that patient cost-sharing has a negative effect on the utilization of recommended preventive services (i.e. counseling, blood pressure screening, Pap smear and mammogram) (Solanki & Schauffler, 1999; Geetesh Solanki, Helen H Schauffler, & Leonard S Miller, 2000b). One study (Solanki & Schauffler, 1999) also finds that a deductible and coinsurance have a greater negative effect than a copayment. Lack of health insurance coverage reduces the use of some preventive services as well. The type of health plan can significantly affect cancer screening and blood pressure, as well as cholesterol level screening (Faulkner & Schauffler, 1997). Although an office visit copayment has a significant negative impact on comprehensive examination, it has no impact on the demand of cancer screening tests (Cherkin et al., 1990).

Figure 2.2 The impact of out-of-pocket payments on secondary prevention

In contrast, an HIE study (Lurie et al., 1987) finds a significant negative effect of cost-sharing on rates of Pap smear received by women aged 45 to 65 years. It is argued that this effect might be significant only for low-income women (Cherkin et al., 1990).

Appendix C provides more detailed information about publications such as the origin of the data, type of publication, study design, outcome and predictor variables, their internal and external validity as well as their conclusions and policy recommendations.

2.4 Discussion

The results indicate that despite increased attention to the impact of cost-sharing on health-related behavior and prevention during the last decade, empirical evidence of a causal relation between out-of-pocket payments and prevention is still lacking.

Most studies originate from the US and only few publications in English are from Europe. The variety of health care plans in the US health care system, which is largely served by the private sector, makes cost-sharing one of the key regulatory mechanisms of cost controlling and a source of contribution by the insured. This explains the high interest in cost-sharing and the need for studies that assess the impact of cost-sharing (Reinhardt, 1993). At the same time, health policy in most European countries whose health care systems are more often publicly financed rather than privately financed focuses more on supply-side restrictions like implementing budget caps rather than demand-side restrictions like cost-sharing. Therefore, cost-sharing is limited in Europe (Ros, Groenewegen, & Delnoij, 2000).

Our results show that despite the presence of studies that focus on the relationship between cost-sharing and prevention, the data used are not always collected with the primary objective to test this relationship. Most studies are based on claims and administrative data that can only provide information on the scope of related payments and not necessarily on the reason of such payment (Burke, Sander, Shah, Zarotsky, & Henk, 2010). This leads to a lack of construct validity of the results in general, even if the study design is clear enough in terms of internal validity as suggested by our review. Additionally, the majority of publications fail to provide evidence of the generalizability (external validity) of their results. Therefore, it is not always possible to interpret or analyze patient behavior in relation to payments. Moreover, there is a lack of experimental studies, partly because real

experiments on this topic are not always possible for ethical reasons (Skriabikova, Pavlova, & Groot, 2010).

Studies have investigated the impact of very different levels of cost-sharing or out-of-pocket payments. Some studies have observed the impact of not having any insurance plan or having supplementary or private insurance on patient behavior (Schneider & Zerth, 2011). Others have focused on different levels of insurance coverage, for instance, having a full coverage plan for pharmacotherapy (Choudhry, Avorn, Antman, Schneeweiss, & Shrank, 2007), or different levels of insurance coverage for preventive services (Faulkner & Schauffler, 1997). These variables indirectly imply cost-sharing. Still others have examined different levels of copayments (Burke et al., 2010; Choudhry et al., 2007; Ellis et al., 2004; Huskamp et al., 2003; Taira, Wong, Frech-Tamas, & Chung, 2006), coinsurance (Mahoney, 2005; Pilote et al., 2002), or a deductible (Solanki & Schauffler, 1999; Solanki et al., 2000b). Such arrangements directly affect the amount of money those patients pay at the point of services use. In addition, the effect of price of services regardless of the role of insurance is examined in some publications (Ashraf et al., 2007; Harvey, 1994).

The measures of preventive behavior and use of preventive services also vary across studies, including the probability of healthy behavior (Courbage & Coulon, 2004), the proportion of people who engage in activities or receive some services (Fronstin, 2009), the quantity of prescribed drug purchased (J. Blustein, 2000; Landsman, YU, Liu, Teutsch, & Berger, 2005; Piette, Wagner, Potter, & Schillinger, 2004), and/or health products purchasing (Ashraf et al., 2007; Cohen & Dupas, 2008; Guyatt, Ochola, & Snow, 2002; Okrah, Traoré, Palé, Sommerfeld, & Müller, 2002) as well as health outcomes, i.e. mortality rate (Brinkhof et al., 2008; Choudhry et al., 2007) or hospitalization rate (Heisler et al., 2004).

The great diversity in indicators of cost-sharing and preventive behavior, discussed above, makes it difficult to infer causal relationships between these variables. Moreover, most studies reviewed use a revealed preference method. Such ex-post evaluation of patient behavior could potentially be biased by other factors, such as quality or provider characteristics (Skriabikova et al., 2010). In order to avoid this problem, future research could use a combination of revealed and stated preference methods.

2.4.1 The impact of out-of-pocket payments on healthy behavior

In theory, higher levels of insurance coverage lower the incentive for healthy behavior, if the insurer is not able to observe patient behavior or to infer the level of prevention from the loss (Courbage & Coulon, 2004; Schneider & Zerth, 2011; see also Chapter 1). Hence, incomplete health insurance coverage due to cost-sharing is considered a solution to the ex-ante moral hazard problem (Kenkel, 2000). The few studies that address this theory and test the impact of insurance on healthy behavior come to different conclusions (Courbage & Coulon, 2004; Schneider & Zerth, 2011). Thus, even though, healthy behavior can be promoted by different incentives, the role of health insurance coverage and out-of-pocket payments are still not empirically established. Moreover, for some unhealthy behaviors like smoking, which have the propensity to be addictive, individual addiction and societal tolerance can have an important role as well (Jones, 1994; Lemmens, Oenema, Knut, & Brug, 2008).

2.4.2 The impact of out-of-pocket payments on preventive services utilization

Few studies address the impact of out-of-pocket payments on the utilization of preventive services particularly with regard to the existence or absence of ex-ante moral hazard in the health care system. If it is assumed that consumers view prevention and cure as complements rather than as substitutes (Kenkel, 2000), it would mean that insurance coverage for curative care may encourage the use of preventive services designed for an early detection of disease. This is mainly because early detection is valuable only if it can be followed by curative care (Kenkel, 2000). In order to demonstrate this argument, one must show that insurance coverage for curative care would increase the utilization of preventive services even if they are not covered. However, currently, there are no studies that examine this claim. Existing publications (Cherkin et al., 1990; Lurie et al., 1987; Solanki & Schauffler, 1999; Solanki et al., 2000b) only examine the relationship between cost-sharing for preventive services and their utilization. They mostly conclude that out-of-pocket payments decrease the utilization of preventive services because they make them more costly. However, the question whether out-of-pocket payments for curative care can prompt healthy behavior or encourage people to use preventive services even when they are not insured still remains unanswered.

2.5 Conclusion

Our results strongly support the concept that cost-sharing, as a financial barrier, decreases both medication adherence and the use of preventive services, which negatively affects secondary prevention. Similar conclusions may apply to immunization and utilization of some health products that are necessary for primary prevention. Moreover, preventive measures like vaccination generate positive externalities which imply that they should—at least partly—be publicly funded (Cohen & Dupas, 2008). Although it is argued that cost-sharing for commodities that require intensive use (adherence) might lead to a greater or more intensive use among owners, it still needs to be empirically proven (Ashraf et al., 2007; Cohen & Dupas, 2008).

In conclusion, the variety in study designs of the publications reviewed here makes it difficult to interpret the results and make comparisons. In addition, the cost-sharing arrangements considered in the publications have not been related to patients' actual income. Thus, it is difficult to give robust policy recommendations about out-of-pocket payments with regard to health-related and preventive behavior.

Nevertheless, our findings support calls to reconsider how preventive services should be financed. Decision-makers should plan and design a patient payment scheme based on lower patient cost-sharing for services that aside from patients could more generally benefit society. Although introducing cost-sharing is a prevailing cost-containment approach, it should be considered that adherence to preventive services actually reduces costs for health care (Chernew et al., 2008). Thus, increasing the adherence to preventive services as well as encouraging people to pursue a healthier lifestyle could be the effective cost-containment approach that should be regarded by decision-makers.

Further research is required to answer the question of adequate levels of cost-sharing for a country or for an insurance scheme. In addition, more research is needed to explore the actual impact of cost-sharing on health-related lifestyles, as well as to explain the role of other relevant determinants (e.g. income, education) that could impact this relationship.

Chapter 3

Socioeconomic aspects of health-related behaviors and their dynamics: a case study for the Netherlands

This chapter draws upon:

Rezayatmand, R., Pavlova, M and Groot, W (2012). Health insurance and the decision to change health-related lifestyle: a case study from the Netherlands. Health and Aging Newsletter, Geneva Association, 27, 12-15.

Abstract

Although comprehensive health insurance coverage could discourage individual lifestyle improvements due to the problem of ex-ante moral hazard, few studies have examined this effect. This chapter studies the association of a comprehensive set of factors including socio-demographic, socioeconomic, health status, health insurance and perceived change in health insurance coverage with health-related behaviors and their dynamics. Specifically, the chapter explores the consistency of the effect of these factors across different types of behavior as well as across the dynamics of each behavior

This chapter uses data from SHARE for the Netherlands in 2004 and 2007 (before and after the health insurance reform in the country). A logit model is used to study health-related behaviors (daily smoking, excessive alcohol use and physical inactivity in 2004) and their corresponding changes (stopping or starting unhealthy behavior between 2004 and 2007). A multinomial model is also estimated.

Our findings show that all above mentioned factors are associated with health-related behaviors but not in a consistent way across all behaviors. Moreover, the dynamics of each behavior (positive or negative change) is not necessarily determined by the same factors that determine the state of that behavior. We also find that better perceived health insurance coverage is associated with a healthier lifestyle. Future research should be designed to identify a causal effect of health insurance on health-related behavior across different countries considering the county context to separate the effect of institutions from the pure effect of insurance.

3.1 Introduction

There is ample evidence that an unhealthy lifestyle significantly contributes to the burden of disease and increases health care costs (Oldridge, 2008). Thus, scarce resources are being spent on the treatment of diseases that could have been prevented by a healthier lifestyle (Feiring, 2008). At the same time, as outlined in Chapter 1, evidence points to a high worldwide prevalence of unhealthy behaviors (Alwan, 2011; Mackenbach, 2005) as well as to the role of such behaviors as a risk factor for lethal, indeed costly diseases (Deaton et al., 2011; Scarborough et al., 2011). This indicates a need for change in individuals' behaviors. As a result, the WHO (among other organizations) calls for a shift in the focus from treatment of illness to prevention by changing individuals' health-related behavior (Oldridge, 2008). In doing so, however, we need a better understanding of the factors that determine individuals' choices of unhealthy behaviors and their decisions to change those behaviors.

Prior research has already documented that an unhealthy lifestyle is related to a range of factors. However, much of this research has solely focused on some socioeconomic factors and health status (Harper & Lynch, 2007; P. B. Johnson & Richter, 2002; Laaksonen, Prättälä, & Lahelma, 2003; Newsom et al., 2012; Shankar, McMunn, & Steptoe, 2010). At the same time, as mentioned in Chapter 1, basic economic theory suggests that comprehensive health insurance coverage could discourage individual lifestyle improvement and prevention activities, which is known as the ex-ante moral hazard problem (Dave & Kaestner, 2009). Few studies have actually investigated the role of health insurance in health-related behaviors and their changes (see Chapter 2). In addition, previous studies have mostly focused on only one type of unhealthy behavior (Clemens, Matthews, Young, & Powers, 2007; Merrick et al., 2008; Nagelhout et al., 2012; Platt, Sloan, & Costanzo, 2010; Willemsen, Hoogenveen, & Van Der Lucht, 2002), while it is interesting and also necessary to find out whether the effect of these variables are consistent across different health-related behaviors.

Our contribution to the literature is three-fold. First, with previous studies in mind, we define a comprehensive set of factors which includes socio-demographic, socioeconomic, health status, health insurance and perceived change in health insurance coverage. Second, the same set of factors is exploited to predict the three most common types of health-related behaviors, i.e. daily smoking, alcohol consumption and physical inactivity. This gives the possibility to identify whether and to what extent the effects of explanatory variables are consistent

among different behaviors. The third contribution is that, besides behavior per se, we also study positive and negative changes in behavior, which provides more insight into the dynamics and consistency of the effect of each factor. As a result, this chapter aims to examine the association of the above-mentioned factors with health-related behaviors and their dynamics. Specifically, the chapter explores the consistency of the effect of these factors across different types of behavior as well as across the dynamics of each behavior.

This chapter focuses on the Netherlands where a universal compulsory basic health insurance was introduced in 2006. It replaced the former public and private health insurance systems where individuals with a gross individual annual income up to a ceiling set by the government were entitled to the compulsory social insurance and those with a higher individual income had to buy the voluntary private health insurance.

This chapter uses Dutch data from the first and second wave of SHARE which were collected in 2004 and 2007 (i.e. before and after the introduction of the universal health insurance in the Netherlands). However, given data at hand, we do not attempt to study the effect of the health insurance reform. Instead, we attempt to explore factors, including health insurance coverage, associated with the individual's choice of unhealthy behaviors and the decision to change those behaviors. The fact that the reform took place in the Netherlands suggests that insurance coverage for some individuals might have changed. For example, as the new system is mandatory for everyone, a better insurance coverage is expected for those who had voluntary private insurance. Thus, apart from including the type of health insurance in our analysis, we are also able to include the change in health insurance coverage while analyzing the dynamics of health-related behavior, more specifically the perceived change in insurance coverage. We explore whether it implies conformity to ex-ante moral hazard.

The subsequent background section provides more detailed information about the health insurance system in the Netherlands before and after the reform. A logit model is used to regress health-related behaviors and their corresponding changes on a comprehensive set of explanatory variables. A multinomial model is also estimated.

3.2 Background

Until 2006, the Netherlands had a two tier system of public and private health insurance. A statutory sickness fund scheme offered mandatory social health

insurance to employees with a gross individual annual income up to a ceiling that government determined each year (in 2003, the ceiling was € 31,750). This scheme also covered students, the elderly, and the self-employed with low income. Its benefits package was quite generous which included a wide range of outpatient and inpatient health care services plus medical aids, rehabilitation care, paramedical care (e.g. physiotherapy), and even some types of dental care.

Those who did not meet the sickness funds' eligibility criteria (mainly higher income people) could take out private insurance. There were also two other types of private insurance. One was a specific scheme for public employees working with municipal and provincial authorities, the police force, and the fire brigades. This scheme was quite similar to the social health insurance. The other type was a special scheme (WTZ¹) for those who were not eligible for social insurance but at the same time were not able to buy a private health insurance. In fact, this scheme was a public provision to ensure access to health insurance for low-income and high-risk groups that did not qualify for social health insurance. It is evident that there was a large heterogeneity in private health insurance plans. Thus, the distinction between private and social health insurance seems somewhat arbitrary (Maarse & Okma, 2004).

The new health insurance Act, which took effect on 1 January 2006, replaced this two tier system with a single universal scheme in which all legal residents of the country are required to purchase basic health insurance coverage from a private insurer. According to the new rules, enrollment is mandatory. The insurer must accept every applicant for the basic package. The basic health insurance package is determined by the government and it is virtually as generous as previous sickness funds' benefits package (Leu & Fund, 2009).

3.3 Methods

3.3.1 Data and study sample

This chapter uses Dutch survey data from the first and second wave of SHARE (see Chapter 1, Section 1.6). In the Netherlands, the first and the second wave of the SHARE have been performed in 2004 and 2007. The first SHARE wave comprises a sample size of 2979 individuals (household response rate of 61.6% and individual (within household) response rate of 87.8%) (De Luca & Peracchi, 2005).

¹ WTZ, in Dutch, Wet op de Toegang tot Ziektekostenverzekeringen (Health Insurance Access Act)

The total sample in the second wave includes 2661 individuals, while the longitudinal sample consists of 1777 participants. The attrition analysis that we carried out shows no selective dropout from the sample in terms of gender or annual household gross income. However, it shows that those who remain in the sample compared to those who drop out are on average relatively younger (age 62.52 versus 63.94 p value = 0.0001), have lower education level (ISCED) and are more likely to live with a partner. Attrition analysis carried out by the SHARE (Schroder, 2008) does not show clear cut results for demographic variables that predict the attrition rate. In total, 1745 out of 1777 individuals in longitudinal sample answered all questions corresponding to three health-related behaviors in both years (2004 and 2007). This particular set of individuals forms the sample for analysis in this chapter. Because the fourth wave of SHARE has no information about the type of insurance, we could not include this wave in the present analysis. A more detailed description of the Dutch SHARE dataset, its methods, sampling frame, and respondents is provided elsewhere (Klevmarken, Hesselius, & Swensson, 2005).

3.3.2 Indicators of unhealthy behavior

The indicators of unhealthy behavior used in this chapter are as follows.

Smoking: Individuals are asked if they have ever smoked daily for a period of at least one year. Those who reply affirmatively are asked whether or not they currently smoked. Respondents who answered ‘yes’ to both questions are classified as current daily smoker.

Excessive alcohol use: Participants are asked about the frequency of drinking more than two glasses of beer, wine, or hard liquors (i.e. almost every day, five or six days a week, three or four days a week, once or twice a month, less than once a month, and not at all in the last six months). We use the constructed dummy variable by SHARE comprising information of those who choose the options of almost every day or five/six days a week. This variable is the closest approximation to more than the recommended level of drinking available in SHARE.

Physical inactivity: Individuals are asked how often they engage in vigorous activity (i.e. sports, heavy housework, or a job that requires physical labor) or moderate activity (i.e. activities requiring a low or moderate level of energy such as gardening, cleaning the car, or walking) with the following response options: more than once a week, once a week, one to three times a month, or hardly ever, or never. A dummy variable constructed by SHARE is used which describes physically

inactive individuals as those who never or almost never engage in moderate or vigorous physical activity.

Behavior change: Health-related behavior of an individual is compared between 2004 and 2007. Consequently, we create six variables of interest to indicate behavior changes over the time: three dummy variables that indicate a positive change (i.e. for those engaged in unhealthy behavior in 2004); and three dummy variables that indicate a negative change (i.e. for those who did not engage in unhealthy behavior in 2004). As a result, we are able to run separate models for positive and negative change to distinguish between positive/no change (continuing healthy behavior) and negative/no change (continuing unhealthy behavior). For instance, in the positive change model, we compare those who stop smoking with current smokers, while in the negative change model we compare those who start smoking with never smokers.

3.3.3 Explanatory variables

The following groups of explanatory variables are included in the models.

Demographics: For age, we create dummies to indicate four age categories (i.e. aged 55 or under, 56-64, 65-74, and 75 or older). We define these age categories considering that the majority of our respondents are aged 55 or older, and also that the official retirement age in the Netherlands is 65 years. Marital status is classified into two categories of living with or without spouse or partner. For all variables, the value for 2004 is used.

Socioeconomic status: Individuals' educational levels are classified into four groups based on the international standard classification of education (ISCED-97) used by SHARE. Details about ISCED-97 scale can be found in appendix D. We also use quintiles of annual household gross income in our analysis. For these variables, the value for 2004 is used.

Health status: As a proxy for health condition in 2004, we use a self-rated question, ranking individuals' self-perceived health status from poor to excellent. At the same time, a question on activity limitation because of a health problem (the so-called Global Activity Limitation Index (GALI) (Jagger et al., 2010)) is included. Using the health indicators of two years, we create dummies for a worse or a better condition in 2007 compared to 2004.

For a more straightforward interpretation of the results, we enter 'education', 'annual gross household income quintile' and 'self-perceived health' as

continuous variables in the models. However, we also run regressions for each model while treating them as categorical explanatory variables.

Health insurance status: To indicate the individuals' health insurance status at the baseline (2004), we create dummies for having 'voluntary private insurance', having 'social insurance' or having 'no insurance'. In addition, the variable indicating individuals' health insurance deductible is added. As mentioned earlier, it is expected that the type of health insurance in 2004 depends on the level of income, thus we also add the interaction between annual household gross income quintile and the type of insurance in our models. In the second wave, respondents are asked to evaluate their current health insurance coverage (as compared to what they have had in the first wave) whether it is worse or better coverage, or no change. We take this variable as an indicator of the perceived change in health insurance status. A more detailed description of all variables used in the present analysis is provided in appendix D.

3.3.4 Analysis

A binary logistic regression is used to estimate base models in 2004 as well as change models for 2004-2007. The set of explanatory variables used for the change models is slightly different from the base models. The change models include more explanatory variables which indicate positive or negative changes in health status and health insurance coverage in 2007. These models also include a dummy variable indicating a change in marital status between 2004 and 2007. In addition, these models only include a dummy for voluntary private insurance. The reason for not including the dummy variable of "no insurance" is the low number of observations. In fact, running a separate model for positive and negative change enables us to compare each change group with its corresponding no-change group (i.e. those who continue unhealthy behavior for positive change and those who continue healthy behavior for negative change), while this is not possible in a multinomial approach. However, in order to get more insight into the dynamics of health-related behaviors, we also run a multinomial logistic regression with four options (i.e. continue unhealthy behavior, positive change, continue healthy behavior – base category, and negative change) while comparing all options with those who continue their healthy behavior in 2007. The analysis is carried out using STATA version 11.

3.4 Results

3.4.1 Descriptive statistics

As Table 3.1 shows, in 2004 (the baseline year), the prevalence of unhealthy behavior for daily smoking, excessive alcohol use and physical inactivity was 24%, 18%, and 4%, respectively. Regarding health insurance status, 60% of respondents had compulsory social insurance and 36% had a voluntary private insurance, while 4% had no insurance. In 2007, 19% of daily smokers stopped daily smoking, while 3% of non-daily smokers started doing so; 63% of excessive alcohol users stopped excessive drinking, while 4% of non-excessive alcohol users started excessive drinking and, 58% of physically inactive individuals stopped physical inactivity, while 6% of physically active respondents started physical inactivity. As the new universal health insurance coverage has been introduced since the first of January 2006, everyone in 2007 was obliged to be insured under the new system. However, when individuals were asked to compare their health insurance coverage between 2004 and 2007, 11% of respondents stated that they had better health insurance coverage in 2007, while 8% report the contrary. Given the age specification of the SHARE dataset, our results refer to people aged 50 and over.

3.4.2 Regression results

Tables 3.2, 3.3 and 3.4 show the regression results for our base models in 2004, as well as for the positive and the negative change models between 2004 and 2007, respectively. All regression models are statistically significant except the one for a positive change in physical inactivity. For this non-significant model, we present the best specification we could obtain.

Table 3.1 *Descriptive statistics*

Variable group	Variables	N	Range or coding	Median	Mean	SD
Dependent variables						
<i>Level variables in 2004</i>						
<i>Changes in 2007</i>	Current daily smoking	1745	yes=1 no=0	0	0.24	0.426
	Excessive alcohol use	1745	yes=1 no=0	0	0.18	0.384
	Physical inactivity	1745	yes=1 no=0	0	0.04	0.205
	Stop daily smoking	414	yes=1 no=0	0	0.19	0.395
	Start daily smoking	1331	yes=1 no=0	0	0.03	0.171
	Stop excessive alcohol use	314	yes=1 no=0	1	0.63	0.483
	Start excessive alcohol use	1431	yes=1 no=0	0	0.04	0.196
	Stop physical inactivity	77	yes=1 no=0	1	0.58	0.496
	Start physical inactivity	1668	yes=1 no=0	0	0.06	0.234
Explanatory variables						
<i>Level variables in 2004</i>						
<i>Changes in 2007</i>	Age	1745	35-93	61	62.52	9.362
	Gender	1745	male=0 Female=1	1	0.54	0.498
	Marital Status	1745	with partner=1 without=0	1	0.8	0.404
	Education (based on ISCED) ¹	1745	1-4 ¹	2	2.54	0.978
	Annual gross HH income €	1745	0-367555	38948	48927.97	40043.76
	Perceived health ²	1745	1-5 (Poor=1 Excellent=5) ²	3	3.22	1.023
	GALL(<i>Global Activity Limitation Index</i>)	1745	limited=1 not limited=0	0	0.43	0.495
	Health insurance deductible €	1558	0-5000	0	86.071	265.72
	Private insurance	1735	yes=1 no=0	0	0.36	0.481
	No insurance	1735	yes=1 no=0	0	0.04	0.189
	Better perceived health	1745	yes=1 no=0	0	0.06	0.246
	Worse perceived health	1745	yes=1 no=0	0	0.26	0.437

Variable group	Variables	N	Range or coding	Median	Mean	SD
	Non-limited GALI	1745	yes=1 no=0	0	0.14	0.347
	Limited GALI	1745	yes=1 no=0	0	0.18	0.381
	Better health insurance coverage	1745	yes=1 no=0	0	0.11	0.311
	Worse health insurance coverage	1745	yes=1 no=0	0	0.08	0.269

¹ International Standard Classification of Education (ISCED-97); N (%) ISCED1:231(13.2%); ISCED2:701(40.2%); ISCED3:408(23.4%); ISCED4:375(21.5%)

² Perceived health: N(%); Poor:51(2.9%);Fair:356(20.4%);Good:749(42.9%);Very good:336(19.3%);Excellent:253(14.5%)

As previously noted, we also ran regressions for each model while treating ‘education’, ‘annual gross household income quintile’ and ‘self-perceived health’ as categorical explanatory variables but because this did not change the results, we keep the models as presented in the tables. Apart from that, we used the likelihood ratio test to test whether or not analysis should be stratified based on gender. However, the test did not show statistically significant results for daily smoking and excessive alcohol use. In case of physical inactivity, a gender-stratified analysis was not possible because of the very low number of observations per gender. In addition, as a robustness check we separated out those with limitations on activity (GALI) in the regression of physical inactivity (our base model in 2004) but the results did not significantly change. Doing the same was not possible in case of positive change in physical activity in 2007 because it led to an insufficient number of observations. However, while leaving those with limitations on activity out from the model of negative change in physical activity (2007), the effect of age and gender on starting physical inactivity disappeared. Thus, the effect of age and gender on becoming physically inactive in 2007 (as reported in table 3.4) seems to be mostly driven by those who have limitation on activity. Below, the regression results are summarized based on the explanatory variables.

3.4.3 Socio-demographic and socioeconomic variables

The influence of socio-demographic and socioeconomic variables on health behaviors can be summarized as follows based on the regression results.

Age: Table 3.2 shows that in 2004, those who are in the oldest age category (age ≥ 75) have the lowest likelihood of daily smoking (OR=0.25). However, individuals in the age 56-64 are more likely to excessive alcohol use (OR=1.36) than those in the reference age group (age ≤ 55). Those aged 75 or older are considerably more likely to be physically inactive (OR=4.48) in 2004 (Table 3.2) or become physically inactive (OR=3.02) in 2007 (Table 3.4).

Gender: As depicted in Table 3.2, women are less likely than men to smoke daily (OR=0.74) and to excessively use alcohol (OR=0.55) but more likely to be physically inactive (OR=1.60) in 2004. The results of the change models 2004-2007 (Table 3.3 and 3.4) also show that being a female rather than a male considerably increases the odds of stopping excessive alcohol use (OR=2.57) and decreases the odds of starting excessive alcohol use (OR=0.32). However, it still increases the odds of becoming physically inactive (OR=1.77).

Marital status: Those who live with a partner in 2004 are less likely (OR=0.74) to smoke than those who live alone (Table 3.2). Moreover, they are less likely to start excessive alcohol use (OR=0.53) in 2007 (Table 3.4).

Education: Those with a higher education are less likely (OR=0.82) to smoke than those with a lower education in 2004 (Table 3.2). In addition, among those who are engaged in extensive or moderate physical activity in 2004, higher-educated individuals have lower odds (OR=0.66) to negatively change their behavior and become physically inactive in 2007 compared to lower-educated individuals (Table 3.4).

Annual gross household income quintile: As mentioned earlier, we included the interaction term between income and the type of insurance in our models which appears statistically significant for daily smoking, excessive alcohol use and stopping excessive alcohol use. Thus, the effect of income among those with private insurance is determined by the two corresponding odds ratios (i.e. income quintile and the interaction term between the income quintile and having private insurance). Our results show that a one unit increase in household income quintile is associated with an increase in the odds of daily smoking (OR=1.25) and excessive alcohol use (OR=1.34) in 2004. At the same time, a one unit increase in household income quintile is associated with an increase in the odds of stopping excessive alcohol use (OR=1.69)². Among those with compulsory social health insurance, the effect of income quintile is not statistically significant for both health-related behaviors and change in behaviors.

² Let β_1 , β_2 and β_{12} denote the coefficients related to annual gross household income quintile, private insurance, and the interaction term, respectively. Then, the odds ratio of respective dependent variable for one unit change in income quintile is calculated by $e^{\beta_1} \cdot e^{\beta_{12}}$ among those with private health insurance. Having substituted odds ratio from Tables 3.2-3.4 we get the odds ratio for respective behavior as presented in the text, which are: 1.25(1.01*1.24), 1.34(1.05*1.28) and 1.69(1*1.69) for daily smoking, excessive alcohol use, and stopping excessive alcohol use, respectively. However, the corresponding odds ratio for those with compulsory social insurance is e^{β_1} which is the odds ratio of respective behavior for annual gross household income quintile as presented in Tables 3.2-3.4.

Table 3.2 *Health-related behavior in 2004*

	Daily smoking			Excessive alcohol use			Physical inactivity		
	OR	95 % CI		OR	95 % CI		OR	95 % CI	
		L	U		L	U		L	U
<i>Explanatory variables</i>									
Age 56-64	0.75 ⁺	0.56	1.01	1.36 ⁺	0.97	1.91	1.12	0.46	2.68
Age 65-74	0.43 ^{**}	0.30	0.61	1.03	0.69	1.54	2.05	0.87	4.86
Age ≥ 75	0.25 ^{**}	0.15	0.41	0.68	0.39	1.17	4.48 ^{**}	1.86	10.83
Gender	0.74 [*]	0.58	0.95	0.55 ^{**}	0.41	0.73	1.59	0.90	2.81
Marital status	0.74 ⁺	0.54	1.02	1.25	0.84	1.87	1.11	0.58	2.12
Education	0.82 ^{**}	0.71	0.95	1.09	0.93	1.28	1.03	0.73	1.44
Annual HH gross income quintile	1.01	0.90	1.14	1.05	0.91	1.21	0.99	0.76	1.29
Perceived health	0.79 ^{**}	0.69	0.91	1.07	0.92	1.25	0.32 ^{**}	0.22	0.47
GALI (Global Limitation Index)	0.68 ^{**}	0.51	0.90	0.86	0.63	1.18	0.80	0.42	1.52
Health insurance deductible	0.95	0.83	1.09	1.00	0.87	1.15	0.90	0.62	1.29
Private insurance	0.34 [*]	0.15	0.77	0.49	0.20	1.17	1.59	0.35	7.19
No insurance	1.59	0.25	10.08	0.75	0.11	4.87	0.07	0.00	430.57
<i>Interaction</i>									
HH income quintile * Private insurance	1.24 ⁺	1.00	1.54	1.28 [*]	1.02	1.61	0.85	0.54	1.35
HH income quintile * NO insurance	0.75	0.44	1.28	1.27	0.77	2.10	1.73	0.21	14.24
<i>Other model specification</i>									
	<i>Pseudo R2</i> .050			<i>Pseudo R2</i> .053			<i>Pseudo R2</i> .159		
	<i>Model χ^2 (14)**</i> 86.09			<i>Model χ^2 (14)**</i> 76.71			<i>Model χ^2 (14)**</i> 83.83		
N (included in analysis)	1533			1533			1533		

^{**}Significant at 1% level; ^{*}significant at 5% level; ⁺significant at 10% level; the age groups are compared to age ≤ 55

The results of the multinomial approach (Appendix E), with the base category of those who continue healthy behavior, show that those who are in an older age group, live with a partner, and have more education in 2004 are less likely to continue daily smoking in 2007. Women are also less likely to continue excessive alcohol use.

Table 3.3 *Positive change in health-related behavior in 2007 (Toward a healthier lifestyle)*

	<i>Stop daily smoking</i>			<i>Stop excessive alcohol use</i>			<i>Stop physical inactivity</i>		
	OR	95 % CI		OR	95 % CI		OR	95 % CI	
		L	U		L	U		L	U
<i>Explanatory variables</i>									
Age 56-64	1.78	0.88	3.58	1.24	0.61	2.51	0.28	0.01	6.1
Age 65-74	1.45	0.61	3.43	1.00	0.43	2.31	21.67+	0.69	678.13
Age≥75	0.28	0.03	2.35	1.11	0.36	3.43	11.95	0.39	369.78
Gender	0.60+	0.33	1.10	2.57**	1.40	4.70	1.28	0.25	6.61
Marital status	3.71*	1.31	10.52	0.71	0.30	1.67	9.65*	1.22	76.43
Education	1.10	0.78	1.55	0.95	0.68	1.34	1.32	0.48	3.61
Annual HH gross income quintile	1.08	0.82	1.43	1.00	0.74	1.36	0.88	0.35	2.20
Perceived health	1.44*	1.02	2.04	1.36+	1.00	1.85	0.56	0.16	1.94
Better perceived health	2.53	0.60	10.60	0.77	0.25	2.39	-----	-----	-----
Worse perceived health	3.96**	1.90	8.23	1.70	0.84	3.43	0.07*	0.01	0.64
GALI (Global Limitation Index)	0.74	0.31	1.76	0.81	0.36	1.86	0.13	0.00	5.54
Non-limited GALI	2.44+	0.89	6.73	1.00	0.38	2.60	2.04	0.12	33.68
Limited GALI	0.75	0.33	1.72	0.88	0.43	1.80	0.27	0.01	6.02
Health insurance deductible	1.40*	1.02	1.92	1.13	0.84	1.52	0.40+	0.15	1.10
Private insurance	0.47	0.05	4.18	0.08**	0.01	0.50	0.09	0.00	16.17
Better health insurance coverage	0.46	0.14	1.52	2.61+	0.97	7.05	49.52+	0.90	2716.75
Worse health insurance coverage	0.98	0.32	2.99	0.19**	0.06	0.57	-----	-----	-----
<i>Interaction</i>									
HH income quintile* Private insurance	1.09	0.63	1.86	1.69*	1.05	2.70	1.40	0.36	5.48
<i>Other model specification</i>									
	<i>Pseudo R2 .125</i>			<i>Pseudo R2 .107</i>			<i>Pseudo R2 .344</i>		
	<i>Model $\chi^2(18)**$ 43.39</i>			<i>Model $\chi^2(18)**$ 38.57</i>			<i>Model $\chi^2(18)^+$ 26.46</i>		
<i>N (included in analysis)</i>	<i>361</i>			<i>272</i>			<i>57</i>		

Significant at 1%level;significant at 5% level; +significant at 10%level; the age groups are compared to age≤55

3.4.4 Health status variables

Our findings demonstrate that a one unit increase in self-perceived health is associated with a decrease in the odds of daily smoking ($OR=0.79$) and physical inactivity ($OR=0.32$) in 2004 (Table 3.2) and the odds of their negative change (i.e. start daily smoking and start physical inactivity) in 2007 ($OR=0.57$ and 0.53 , respectively) (Table 3.4). It also increases the odds of a positive change in smoking ($OR=1.44$) and drinking behavior ($OR=1.36$) (Table 3.3). Those who perceive a deterioration in their health condition between 2004 and 2007 are considerably more likely ($OR=3.96$) to quit daily smoking (Table 3.3), but also to become physically inactive ($OR=2.00$) (Table 3.4) than those who do not perceive any change in health status. In 2004 (Table 3.2), those who report a limited GALI have 32% lower odds of daily smoking than those who report a non-limited GALI. In 2007 (Table 3.4), however, a change in GALI from limited to not-limited increases the odds of starting daily smoking by six times ($OR=6.96$). At the same time, a change in GALI to limited from not-limited increases the odds of becoming physically inactive by three times when comparing with no change in GALI between 2004 and 2007.

The results of the multinomial model show that those who have a higher self-perceived health in 2004 are less likely to continue daily smoking as well as physical inactivity in 2007. At the same time, those with limited GALI in 2007 are less likely to continue daily smoking in 2007 (see Appendix E).

3.4.5 Health insurance variables

As mentioned earlier, the interaction term between the type of health insurance and income quintile is statistically significant for daily smoking, excessive alcohol use and stopping excessive alcohol use. As a result, the effect of the type of health insurance is determined by the two corresponding odds ratios (i.e. having private insurance and the interaction term between the income quintile and having private insurance). Thus, among individuals at the lowest income quintile (income quintile=1), those with having voluntary private insurance rather than those with compulsory social insurance have lower odds of daily smoking ($OR=0.42$) and excessive alcohol use ($OR=0.62$) in 2004 as well as lower odds of stopping excessive alcohol use between 2004 and 2007 ($OR=0.13$)³. However, among

³Using the same denotation as previous footnote, the difference between the odds ratio of respective behavior for those with private insurance and those with compulsory social insurance is calculated by

individuals in the highest income quintile, those with private insurance rather than those with compulsory social insurance have higher odds of daily smoking (OR=1.23) and excessive alcohol use (OR=1.68) in 2004, as well as higher odds of stopping excessive alcohol use (OR=1.10) in 2007. To double check our results, we also calculated the marginal effect of the income quintile as well as the incremental effect of having private insurance on the conditional probability of the respective behavior when taking into account the interaction term (all appeared consistent with odds ratio we present).

With regard to the effect of a change in health insurance coverage on a change in health-related behavior, our results (Table 3.3) show that those with better health insurance coverage in 2007 compared to 2004 are more likely (OR=2.61) to stop excessive alcohol use in this year, while those with a worse health insurance coverage are less likely (OR=0.19) to do this. The effect of changes in health insurance coverage on a positive or a negative change in the two other health-related behaviors analyzed in this chapter did not appear to be statistically significant.

Considering the results of our multinomial approach (see Appendix E), we find that those with a better perceived insurance coverage in 2007 are less likely to continue daily smoking and excessive alcohol use in that year. Those with worse perceived health insurance coverage in 2007 are more likely to pursue excessive alcohol use at the same year. We also find that those with private insurance in 2004 have higher odds of continuing daily smoking in 2007. The size of this effect also depends on the level of the annual household gross income quintile; that is belonging to a higher income quintile in 2004 increases the chance of continuing daily smoking in 2007.

$e^{\beta_2 * e^{\beta_{12} * \text{income quintile}}}$. Thus, in the lowest income quintile (income quintile=1), having substituted respective odds ratio from the Tables 3.2-3.4 we will get the odds ratio presented in the text, that are: $0.42(0.34 * 1.24^1)$, $0.62(0.49 * 1.28^1)$ for daily smoking and excessive alcohols, respectively as well as $0.13(0.08 * 1.69^1)$ for stopping excessive alcohol use. To get the respective odds ratio in the highest income quintile (income quintile=5) as presented in the text, the number 1 should be replace by 5.

Table 3.4 *Negative change in health-related behavior in 2007 (Away from a healthier lifestyle)*

	Start daily smoking			Start excessive alcohol use			Start physical inactivity		
	OR	95% CI		OR	95% CI		OR	95% CI	
		L	U		L	U		L	U
<i>Explanatory variables</i>									
Age 56-64	1.81	0.73	4.53	1.60	0.77	3.33	1.21	0.58	2.54
Age 65-74	0.43	0.12	1.47	0.99	0.41	2.37	1.66	0.77	3.56
Age≥75	0.55	0.14	2.17	0.24 ⁺	0.05 ⁺	1.14	3.02 ^{**}	1.31	6.95
Gender	1.24	0.59	2.62	0.32 ^{**}	0.17	0.62	1.77 [*]	1.05	2.96
Marital status	0.67	0.27	1.68	0.53 ⁺	0.26	1.10	1.34	0.71	2.52
Change in marital status	1.95	0.40	9.51	0.68	0.08	5.48	1.87	0.68	5.15
Education	1.04	0.68	1.59	1.35 ⁺	0.95	1.93	0.66 ^{**}	0.49	0.89
Annual HH gross income quintile	0.75	0.52	1.08	0.92	0.67	1.25	0.99	0.77	1.27
Perceived health	0.57 [*]	0.36	0.90	0.97	0.68	1.38	0.53 ^{**}	0.38	0.73
Better perceived health	1.42	0.44	4.57	0.90	0.26	3.15	0.48	0.11	2.10
Worse perceived health	1.63	0.68	3.92	1.58	0.76	3.29	2.00 ^{**}	1.19	3.34
GALI (<i>Global Limitation Index</i>)	0.21 [*]	0.05	0.82	0.78	0.32	1.94	1.91	0.87	4.19
Non-limited GALI	6.96 ^{**}	1.85	26.19	1.49	0.54	4.14	0.66	0.29	1.46
Limited GALI	2.31 ⁺	0.92	5.85	1.27	0.55	2.94	3.18 ^{**}	1.48	6.83
Health insurance deductible	1.09	0.77	1.55	1.01	0.77	1.34	0.93	0.70	1.24
Private insurance	0.29	0.03	2.58	0.52	0.09	3.08	1.44	0.38	5.46
Better health insurance coverage	0.14 ⁺	0.02	1.12	1.17	0.50	2.77	0.89	0.39	2.00
Worse health insurance coverage	0.25	0.03	1.94	1.49	0.55	3.99	0.32 ⁺	0.09	1.10
<i>Interaction</i>									
HH income quintile* private insurance	1.41	0.77	2.59	1.25	0.78	2.02	1.10	0.75	1.63
<i>Other model specification</i>									
	Pseudo R ² .128			Pseudo R ² .079			Pseudo R ² .163		
	<i>Model</i> $\chi^2(19)^{**}$ 39.58			<i>Model</i> $\chi^2(19)^*$ 39.92			<i>Model</i> $\chi^2(18)^{**}$ 102.52		
N (included in analysis)	1162			1257			1470		

^{**}Significant at 1% level; ^{*}significant at 5% level; ⁺significant at 10% level; the age groups are compared to age ≤55

3.5 Discussion

The analysis presented in this chapter is one of few (Courbage & Coulon, 2004; Schneider & Zerth, 2011) on the joint effect of socioeconomic, health status and health insurance coverage on three health-related behaviors (i.e. daily smoking, excessive alcohol use, and physical inactivity) as well as the changes in these behaviors. Much research so far has solely focused on socioeconomic factors and health status (Harper & Lynch, 2007; P. B. Johnson & Richter, 2002; Laaksonen et al., 2003; Newsom et al., 2012; Shankar et al., 2010). Most studies have examined the effect of some of these factors on only one type of unhealthy behavior (Clemens et al., 2007; Merrick et al., 2008; Nagelhout et al., 2012; Platt et al., 2010; Willemssen et al., 2002). Few studies have actually considered health insurance as a potential factor which due to ex-ante moral hazard can also have an effect on individuals' health-related behavior (see Chapter 2). In addition to using a comprehensive set of factors (i.e. socioeconomic, health status and health insurance coverage), we exploit the same set of factors for all behaviors. This gives the possibility to show whether and to what extent the effects of explanatory variables are consistent among different behaviors. Moreover, the panel nature of SHARE dataset enables analyzing how changes in health-related behaviors can be related to changes in health status or health insurance coverage but with the caveat that it cannot be interpreted as a causal effect. It should be emphasized again that given the age specification of the SHARE dataset, our results refer to people aged 50 and over.

3.5.1 Indicators of health-related behaviors

We find that the most consistent predictor of health-related behavior among all three behaviors is gender although it affects each behavior differently. Previous studies also find that the most common types of health-related behaviors are gender-specific, which is of interest for health promotion activities (Hughes, Hannon, Harris, & Patrick, 2010; Nagelhout et al., 2012; Stock, Wille, & Krämer, 2001). Although, our results regarding the socioeconomic determinants of daily smoking are compatible with previous studies (Cho, Khang, Jun, & Kawachi, 2008; Harper & Lynch, 2007; Hughes et al., 2010; Kiecolt-Glaser & Newton, 2001; Molander, Yonker, & Krahn, 2010; Nagelhout et al., 2012; Nystedt, 2006; Smith, Frank, & Mustard, 2009), we did not capture all associations found in previous studies for alcohol consumption (Hughes et al., 2010; Moore et al., 2005). This may to a certain extent be because of the variation in the way drinking behavior is

measured and reported in different studies (Molander et al., 2010). It can also be explained by the fact that we use a wider range of factors which might pick up the effect of other socioeconomic variables.

Our findings show that each health behavior has its own set of determinants. As a result, health-related behaviors cannot be treated as one concept and each behavior should be considered separately. For instance, we find that men are vulnerable to smoking and excessive alcohol use, while women and those who are older are vulnerable to physical inactivity. These findings can provide a framework in targeting policies for health programs aimed at individuals' behavioral change towards a healthier lifestyle.

3.5.2 Indicators of change in health-related behavior

In this chapter, a number of baseline factors and change events predict behavior change, but these are not consistent across all three health-related behaviors. This applies regardless of how we model the change (either using a logit or a multinomial approach). For instance, women are more likely to stop heavy drinking while, at the same time, they are also more likely to become physically inactive. In addition, living with a partner which could encourage positive change in smoking behavior and physical activity, has no such effect on changing drinking behavior, although it discourages negative change in drinking behavior. These results are also in good agreement with previous studies (Eng, Kawachi, Fitzmaurice, & Rimm, 2005; Molander et al., 2010; Nystedt, 2006; Van Loon, Tijhuis, Surtees, & Ormel, 2005).

Health-related variables seem to be the most consistent predictors of changes among all health-related behaviors. An optimal self-perceived health in baseline year (2004) encourages positive and discourages negative change in health-related behavior. While our findings in this chapter imply that people with poorer self-perceived health are those who tend to undertake more unhealthy behaviors (daily smoking and physical inactivity in current analysis), there is also evidence showing the role of unhealthy behavior as a cause of poor self-perceived health (P. B. Johnson & Richter, 2002; Manderbacka, Lundberg, & Martikainen, 1999). This indicates a limitation of our study since we are not able to establish whether poor self-perceived health is caused by smoking or vice versa.

Nevertheless, we find that a deteriorated self-perceived health in the follow-up year (2007) compared to the baseline year (2004) leads individuals to quit smoking, but to start physical inactivity. For smoking, it may be due to the fact that

our sample includes predominantly elderly persons and at this age, the long-term health consequences of smoking are experienced by the elderly themselves or by others of their own age, which may make them more conscious about the need to change. For physical inactivity, it may be due to the individuals' lower ability for physical activity over time. This is also consistent with our results for GALI as we find that those whose GALI changed from not-limited to limited are more likely to become physically inactive. As mentioned earlier, the GALI measures the limitation on activity which is because of a health problem. Thus, becoming physically inactive might be part of the normal process of aging and then could not be totally considered as a negative change in health-related behavior. Nevertheless, physical inactivity as defined by the SHARE means not even engaging in activities that require a moderate level of energy such as gardening, doing a walk, etc. It might imply a sedentary lifestyle which should raise concern given the fact that the large body of evidence points toward its role in increasing all-cause mortality (Kahn et al., 2002). On this account, even though the aging process might increase the interval of physical activity or shift it to a mildly energetic activity, it should not completely stop it. It is also worth noting that when we left those with limitation on activity out from the model of negative change in physical activity (2007), the effect of age and gender on starting physical inactivity disappeared. Thus, the effect of age and gender on becoming physically inactive in 2007 (as reported in Table 3.4) seems to be mostly driven by those who have limitations on daily activity.

As shown in this chapter, the dynamics of each behavior (positive or negative change) is not necessarily determined by the same factors that determine the state of that behavior. In other words, factors that affect a given health-related behavior might have no association with the change in this behavior. However, our results show that when a factor has an effect, its effect is consistent among the state and dynamics of that behavior. For instance, we find that women are more likely to stop excessive alcohol use and less likely to start excessive alcohol use. Similarly, we find that those who live with a partner have more chance to quit daily smoking. Both findings are consistent with our results from the baseline year indicating that women are less likely to be excessive alcohol users and that daily smoking is less prevalent among those who live with a partner. This consistency can clearly be used to identify population groups that are most likely to have an unhealthy lifestyle.

It might be argued that the change in health-related behavior might be due to some policy changes. For instance, the ban on smoking would affect smoking behavior. In the Netherlands smoking has been banned in government building and public places (since 1990) and in workplace (since 2004) with the exception of the

hospitality industry. However, as a smoking ban in public places dates back to many years prior to 2004, it cannot be considered as a new policy change. However, given the data at hand, we are not able to grasp the effect of smoking ban in workplace on our study population. It is worth noting that starting daily smoking at older age is most probably a relapse, because previous studies have already shown that starting smoking for the first time even after the age of 25 is very unlikely (Willemsen et al., 2002).

3.5.3 Income and health insurance-related indicators

We discuss here the effect of health insurance together with the effect of income, as in our study their effects on health-related behaviors depend on each other due to the specificity of the Dutch health insurance system. In this chapter, we find an effect of income only among those who had private insurance in 2004. That is, being in a higher income quintile increases the odds of daily smoking and excessive alcohol use. Previous studies have shown that alcohol consumption is associated with higher income (Costa-i-Font, Hernández-Quevedo, & Jiménez-Rubio, 2012; Moore et al., 2005), while, in contrast, smoking is associated with lower income (Harper & Lynch, 2007; Hughes et al., 2010; Nagelhout et al., 2012; Smith et al., 2009). However, our results should be interpreted given the specificity of private insurance in the Netherlands. As mentioned in the background section of this chapter, individuals whose annual individual gross income was higher than a certain level set by the government were not eligible for compulsory social insurance. They could voluntarily buy private insurance. However, income was not the only factor that determines the type of health insurance. Besides those who bought voluntary health insurance, private health insurance also included two other categories of individuals whose income were the same or even lower than those insured by compulsory social insurance. Public servants and elderly people with low income had private insurance, but were in many respects more similar to people with social insurance. In other words, people with private insurance comprised a quite heterogeneous group in terms of income. It might explain why the effect of income can be seen only among this group and not among those with compulsory social insurance which seems to be a more homogenous group in terms of income.

At the same time, the combined effect of income and type of insurance deters us to draw a general conclusion about the effect of type of insurance. Moreover, the type of health insurance in the Netherlands in 2004 mainly referred to differences in financing and not necessarily to a difference in health insurance

coverage. Hence, it is difficult to justify the effect of type of insurance on the basis of ex-ante moral hazard interpretation (see chapter 1). Nevertheless, for some health-related behaviors analyzed in this chapter, we find that better perceived health insurance coverage in 2007 is associated with a higher likelihood of positive change in those behaviors (e.g. stopping excessive alcohol use) in that year, while worse perceived health insurance coverage is associated with less likelihood of those positive changes. Our results also show that those individuals, who reported that they have had a better insurance coverage in 2007 than 2004, tend not to continue their unhealthy lifestyle in 2007 while those, who reported that they have had a worse health insurance coverage tend to continue their unhealthy lifestyle. As discussed in Chapter 2, previous studies on the effect of health insurance on health behavior have come to contradictory conclusions. Some studies show that individuals without health insurance are more likely to undertake healthy behavior than those who have social health insurance (Schneider & Zerth, 2011). In contrast, other studies find a higher tendency for healthy behavior among privately insured people who enjoy a more generous insurance coverage (Courbage & Coulon, 2004). As noted earlier, due to the specificity of the Dutch health insurance system in 2004, we are not able to draw a clear conclusion about the effect of type of insurance with regard to ex-ante moral hazard. However, our findings about the association between change in perceived health insurance coverage and change in health behavior in 2007 appear to be incompatible with an ex-ante moral hazard interpretation.

Yet, it is important to notice that this individually perceived change in health insurance coverage should not be interpreted as the effect of the reform. As mentioned at the outset of this chapter, given data at hand, our analysis is not designed to study the effect of the health insurance reform in the Netherlands. Instead, it is limited to explore factors, including health insurance, associated with the individual's choice of unhealthy behaviors and their decision to change those behaviors which accordingly limits a causal interpretation of the results. There are also other limitations to be acknowledged. We could not study the effect of having no insurance on changes in behavior since the change models ran very low on the number of observations for this group.

3.6 Conclusion

Having exploited the same set of factors for three health-related behaviors and their positive or negative change in this chapter, we are able to make a comparison

across different health behaviors. These findings show that a variety of factors (i.e. socio-demographic, socioeconomic, health status and health insurance coverage) are associated with health-related behaviors but not in a consistent way across all behaviors. Moreover, the dynamics of a health-related behavior and the state of that behavior are not necessarily associated with the same factor. Therefore, health-related behavior could not be treated as one concept and each behavior should rather be considered separately. Thus, our results provide input to target policies towards individuals in need of lifestyle change. More effort is needed to target men and affluent people to quit smoking and excessive alcohol use, as well as women and the elderly to become physically more active. We also find that better perceived health insurance coverage is associated with a healthier lifestyle which is not compatible with ex-ante moral hazard interpretation. The combined effect of income and type of insurance, which is one specificity of Dutch health insurance system in 2004, deters us to see the effect of type of insurance. Future research should be designed to identify a causal effect of health insurance on health behavior in different countries, accounting, at the same time, for the context of each country to separate the effect of institutions from the pure effect of insurance.

Chapter 4

Smoking behavior and health care costs coverage: a European cross-country comparison

This chapter draws upon:

Rezayatmand, R., Groot, W. and Pavlova, M. (submitted). Smoking behavior and health care cost coverage: a European cross-country comparison

Abstract

The empirical evidence about the effect of smoking on health insurance is not consistent with the expectations based on the notion of adverse selection. This evidence is mostly based on correlational studies which cannot isolate the moral hazard effect from the adverse selection effect.

Exploiting data from SHARE, this chapter uses an instrumental variable strategy to identify the causal effect of daily smoking on health care cost coverage of those at age 50 or above in 12 European countries. Daily smoking is instrumented by a variable indicating whether or not there is any other daily smoker in the household. A self-assessment of health care cost coverage is used as an outcome measure.

We find that daily smoking decreases self-assessed health insurance coverage among women and men who live without a partner. These findings replicate the same counter-intuitive relationship between smoking and health insurance presented in previous studies, but in a language of causality. In addition to this, we contribute to previous studies by a cross country comparison which brings in different institutional arrangement, and by using the self-assessed health care cost coverage which is broader than health insurance coverage.

4.1 Introduction

Adverse selection refers to the phenomenon that individuals, who anticipate higher health care expenditures, are more likely to purchase health insurance or a more extensive coverage (Doiron et al., 2008). A test for the presence of adverse selection is whether people with a higher health risk (e.g. because they smoke) choose for a more comprehensive health insurance coverage. However, a reverse effect is also possible which is termed as ex-ante moral hazard. This refers to a situation where a comprehensive health insurance scheme creates a disincentive for insured individuals to invest in self-protective behavior, such as to refrain from smoking or quitting smoking if already started. Thus, the observed correlation between health care cost coverage and health risk can be a composite of both the adverse selection and the moral hazard effect (see Chapter 1).

Several authors have tested the adverse selection hypothesis by using unhealthy behavior like smoking as an indicator for health risks. But their conclusions contradict the adverse selection explanation. For instance, studies by Hopkins and Kidd (1996), Barrett and Conlon (2003) and Doiron et al. (2008) show that in Australia smokers are less likely to buy private health insurance. Doiron et al. (2008) provide evidence that engaging in risky behavior is positively correlated with being in worse health. They conclude that the decision to buy private health insurance is more affected by other factors such as risk aversion, income or socioeconomic status than adverse selection. In other words, high risk aversion jointly determines the decision to buy private health insurance and the decision not to engage in high risk health-related behavior like smoking (see Chapter 1). At the same time, it is argued that smokers might behave in a myopic manner, implying that they tend to ignore the future consequence of their current consumption (Becker, Grossman, & Murphy, 1994). As a result, these individuals do not consider costs incurred in the future and therefore do not buy (more extensive) health insurance coverage. In a recent study (Lambert, Perelman, Pestieau, & Schoenmaeckers, 2011) using the SHARE dataset, a different health risk indicator has been exploited to track any evidence of adverse selection between health risk and health care cost coverage. The study uses the number of long term spells of ill health in the past as a risk health indicator. This study shows no evidence of adverse selection in health insurance among European elderly people.

All above mentioned studies on adverse selection are correlational studies which fail to identify a casual effect. Moreover, the methodological techniques that are used in those studies could not appropriately isolate the moral hazard effect

from the adverse selection effect. In this chapter, however, we use an instrumental variable strategy (IV) to deal with this simultaneous causality bias and to identify a causal effect. We postulate that smoking is perceived as a health risk by individuals, and potentially affect their health care cost coverage along with other factors like age, gender, education, economic status, and health status. To our knowledge, this is the first study which uses IV to examine the causal effect of smoking on health insurance (i.e. the adverse selection perspective).

Also, most empirical evidence about the relationship between unhealthy behavior (e.g. smoking) and health insurance is limited to one country (Barrett & Conlon, 2003; Doiron et al., 2008; Hopkins & Kidd, 1996). Hence, their results may not be generalized to other countries. However, in this chapter, we use SHARE data which allows for a comparison across European countries included in SHARE. This way, we are able to explore the extent to which the context of each country is related to the adverse selection effect. Our study differs from the work of Lambert et al. (2011) mentioned above (which has also exploited SHARE data) because we explore a different health risk indicator, namely daily smoking.

The following background section provides detailed information on specific institutional arrangements regarding health care cost coverage in European countries. It shows that out of specific institutional arrangement in each country, in most cases, full coverage is likely to be offered at the individuals' discretion. This is the main assumption we are making and analyzing here.

4.2 Background

Health coverage and financial arrangements are fundamental characteristics of a health care system. The WHO has called for universal coverage to assure access to health care for everyone in need (WHO, 2010; see also Chapter 1). Health care coverage can have three dimensions: breadth, the proportion of the population covered by the health care system; scope, the generosity of the benefit package (the services/goods covered); and depth, the level of coverage (the proportion of cost covered) (Teutsch & Rechel, 2012). The institutional arrangements regarding the above dimensions vary between countries. We use the results of an OECD survey on health system characteristics 2008-2009 (Paris, Devaux, & Wei, 2010) to outline the three dimensions of insurance coverage among the countries that we study (Table 4.1).

As depicted in this table, nearly all residents in the countries included in our study are covered by a basic scheme. This coverage is provided either automatically (Denmark, Italy, Spain) or compulsorily (in other countries).

Germany is an exception in the way that high-income people can voluntarily choose a private health insurance instead of social insurance for their basic coverage. Automatic coverage is provided by national (Italy) or local health services (Denmark, Spain) which are financed from taxes. Social health insurance schemes which are financed through income-related social contributions usually provide compulsory coverage but in a slightly different ways across the countries. For instance, in Belgium and Poland there is only one health insurance scheme, while in the other countries there are multiple insurers. In some of these countries, people are allowed to choose their insurer (Czech Republic, Germany, the Netherlands, Switzerland) while in others, there is no choice of insurer, and nevertheless there are multiple insurers (Austria, France, Greece). In the Netherlands and Switzerland, health insurance is compulsory for all, but individuals pay community-rated premiums to private health insurance funds.

Most countries guarantee a high level of coverage particularly for acute inpatient and outpatient (primary physician and specialist contact). France is singular in that it covers only 60% of outpatient physician services. Pharmaceuticals are typically covered at lower levels in most countries except in the Netherlands and Italy where they are fully covered. In order to compare coverage between countries, using the OECD data, we create an indicator based on the level of coverage for the above mentioned services. We assign codes 4 to 1 to the level of coverage 100%, 76-99%, 51-75% and 50% or less, respectively (as defined in the OECD survey). Thus, a country gets a number of 16 if it fully covers the four health care services mentioned in Table 4.1. These results are presented in the last column of that table. For instance, according to this indicator, we can see that the highest coverage is provided in the Netherlands followed by Spain. In contrast, the lowest coverage is being provided in France. However, it is worth noting that this indicator provides information only about the basic health care coverage.

Table 4.1 *Characteristics of basic primary health coverage*

Country	Types of basic primary health coverage (% of population)		The basic health coverage is provided by/consumer's Choice of insurer if multiple Insurer are involved	Private health insurance (% of population)	Coverage(%) of health services by basic primary health coverage					Score		
	Automatic	Compulsory	Voluntary		Duplicate	Complementary	Supplementary	Acute inpatient care	Outpatient primary physician contact	Outpatient specialist contact	Pharmaceuticals	
Austria	0.0	98.7	0.0	Multiple insurers/No	43.5	0.0	46.3	76-99	100	100	76-99	14
Belgium	0.0	99	0.0	Common health insurance scheme	0.0	77.4	77.4	76-99	76-99	76-99	76-99	12
Czech Republic	100	0.0	0.0	Multiple insurers/Yes	0.0	0.0	0.0	76-99	76-99	76-99	51-75	11
Denmark	100	0.0	0.0	Local health services	0.0	15.5	15.5	100	100	100	51-75	14
France	2.5	97.5	0.0	Multiple insurers/No	0.0	92	92	76-99	51-57	51-57	51-75	9
Germany	0.5	83.3	15.2	Multiple insurers/Yes	0.0	17.5	17.5	100	76-99	76-99	76-99	13
Greece	0.0	100	0.0	Multiple insurers/No	8.0	0.0	0.0	76-99	76-99	76-99	76-99	12
Italy	100	0.0	0.0	National health services	15.6	0.0	0.0	100	100	76-99	100	15
Netherlands	0.0	100	0.0	Multiple insurers/Yes	0.0	0.0	92	100	100	100	100	16

Country	Types of basic primary health coverage (% of population)			The basic health coverage is provided by/consumer's Choice of insurer if multiple Insurer are involved		Private health insurance (% of population)		Coverage(%) of health services by basic primary health coverage					Score
	Automatic	Compulsory	Voluntary			Duplicate	Complementary	Supplementary	Acute inpatient care	Outpatient primary physician contact	Outpatient specialist contact	Pharmaceuticals	
Poland	0.0	99	0.0	Common health insurance scheme	2.6	0.0	0.0	0.0	100	100	100	51-75	14
Spain	100	0.0	0.0	Local health services	10.3	0.0	0.0	0.0	100	100	100	76-99	15
Switzerland	0.0	100	0.0	Multiple insurers/Yes	0.0	0.0	29.5	100	100	76-99	76-99	76-99	13

¹ created indicator by authors for basic health care cost coverage (see the background section of this chapter)

Source: Adapted from Paris et al. (2010)

Almost all countries in our study also have institutional arrangements for private health insurance as a secondary source of coverage. Private health insurance can be complementary (covering the user fees), supplementary (increasing the benefit package) or duplicative (providing a quicker access to health care services). As depicted in Table 4.1, complementary private health insurance plays a prominent role in France, filling the gap in coverage for outpatient primary physician and specialist contacts. Supplementary private health insurance is held by 92% of people in the Netherlands. The Czech Republic and Greece report a zero proportion of their population having either complementary or supplementary private health insurance, while 8% of the Greek citizens have obtained duplicate private health insurance.

4.3 Methods

4.3.1 Data and study sample

In this chapter, we use data from the second wave of SHARE (see Chapter 1, Section 1.6). We could not include data from the first and the fourth waves of SHARE because the questions regarding health insurance coverage that we use in our analysis either have not been asked (first wave) or have been asked in a different way (by self-administered questionnaire instead of asking by an interviewer in fourth wave). As mentioned in Chapter 1, the third wave of SHARE, so-called SHARELIFE, focuses on people's life histories and does not provide information relevant to our analysis.

In total, 14 countries are included in the SHARE wave 2, namely; Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Czech Republic, Poland, and Ireland. We had to exclude Ireland and Sweden from our analysis because the imputed variables for annual household net income generated by SHARE were not available for Ireland and the number of missing value for health care cost coverage was considerable in Sweden. Thus, overall, our sample to be analyzed in this chapter consists of 30,536 individuals from 12 countries.

4.3.2 Health care cost coverage variables

In wave 2, the SHARE respondents are asked about their health care cost coverage (see Appendix A). In order to measure the individual's health care cost coverage, the interviewer is instructed to name different types of health care services ranging from visiting a general practitioner to nursing care at home in case of chronic

diseases or disability. Then, the interviewer asks each individual to identify who finally pays for these services by choosing one option from the following four options: 1 = entirely paid by respondent, 2 = mostly paid by respondent, 3 = mostly paid, or reimbursed by social and/or health insurance, and 4 = entirely paid, or reimbursed by social and/or health insurance. For each respondent, we sum up the codes of the response options indicated by the respondent for each service (medical visit to general practitioner, medical visit to specialist when prescribed by general practitioner, prescribed drug and hospitalization in public hospital) to create a variable indicating the extent of self-assessed health care cost coverage. This variable ranges from 4 for those who entirely have to pay for the above mentioned services themselves to 16 for those who will get fully reimbursed by their social or/and health insurance. It should be noted that this variable provides a self-assessment of the extent of the health care cost coverage which might not correspond to the actual coverage. However, in order to affect individuals' behavior, the coverage assessed by the individuals is likely to matter more than the actual coverage, and thus, it is suitable for our analysis. As mentioned earlier, in wave four, the same questions as in the second wave are asked about the health care cost coverage but by means of a self-administered questionnaire. As a result, we could not include this wave both because of the large number of missing values, and because of the inconsistency in data collection compared with the second wave.

4.3.3 Analytical methods

The IV estimation in present analysis uses daily smoking as the endogenous variable. The IV approach involves finding at least one exogenous observable variable (called the instrument) that is highly correlated with the endogenous variable but is not correlated with the error term of the outcome equation (health care cost coverage). In this chapter, self-assessed health care costs coverage is the outcome variable. The IV estimation consists of a two-step process. First, the endogenous variable is run against all covariates including the instrument. Then, the predicted value of the endogenous variable—instead of the actual value—is used in the second stage. Because our variable of interest for daily smoking is binary (yes/no), using a linear model in the first stage is not appropriate. Thus, we fit a treatment-effect model using full maximum likelihood which estimates two regressions simultaneously. The first equation is estimated using probit regression to predict the probability of daily smoking. The second is a linear regression for health insurance coverage. The two error terms are assumed to be jointly normally distributed. More details about the specification of a treatment-effect model are

available in Cameron and Trivedi (2009) and Khandker, Koolwal, and Samad (2010).

According to the health capital model, smoking can be considered as a negative investment in health capital (Grossman, 2000). However, the model does not account for the fact that this decision is not made in isolation. Peer effects in health behavior have been investigated in a rapidly growing empirical literature (Cawley & Ruhm, 2012). For instance, Christakis and Fowler (2008) have reported that smoking cessation by one spouse decreases the other one's chance of smoking by 67%, while the smoking cessation by a sibling decreases the chances only by 25%. Other studies have also found more support for husband's influence than the wife's influence (Homish & Leonard, 2005). Thus, not only social ties but also the nature of social ties may play a role in smoking behavior. Given these facts, two instrumental dummy variables are created: whether the spouse or partner is a daily smoker for those who are living with a partner, and whether there is any other daily smoker in the household (aside from the respondent him/herself) for those who do not live with a partner. By the term 'with a partner' we refer to both legally married couples and those who live together. It is expected that these variables are correlated with smoking behavior but they are not correlated with health care cost coverage (we test whether this assumption is correct). The quality of instruments is also tested using different methods. These results are reported in the result section of this chapter.

We also include other exogenous variables in the models. These include age, education, self-perceived health, and a dummy variable indicating the Global Activity Limitation Index (GALI). Table 4.2 shows all explanatory variables and their coding. For income, we use the variable generated in the SHARE dataset for household annual net income. The SHARE dataset provides five imputed values for each missing household annual net income (SHARE, 2011). We use the median of these five values. The income variable is then adjusted based on purchasing power parity in 2005 in Germany. The logarithmic function of the adjusted value is used as our explanatory variable for income. For education, we use a continuous variable indicating years of education. We include two variables to proxy health status. The first is a self-rated question indicating self-perceived health ranging from poor to excellent. The second is a dummy variable indicating each individual's limitation on activity because of a health problem (the so-called GALI, (Jagger et al., 2010)). Country dummies (with the Netherlands being the reference category) are also included to account for contextual factors of each country. However, in

order to check the robustness of the results, a per-country analysis is also performed for each model.

Table 4.2 *Descriptive statistics*

Country	AT	BE	CH	CZ	DE	DK	ES	FR	GR	IT	NL	PL	Total
	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N
Daily Smoking													
Yes=1	0.15 (0.36)	0.17 (0.38)	0.19 (0.39)	0.21 (0.41)	0.17 (0.37)	0.27 (0.44)	0.15 (0.36)	0.14 (0.35)	0.29 (0.45)	0.17 (0.38)	0.22 (0.42)	0.26 (0.44)	0.20 (0.40)
No=0	1332	3139	1446	2801	2541	2558	2216	2905	3236	2975	2619	2448	30216
Self-assessed health care coverage													
	13.71 (1.99)	11.96 (1.11)	12.78 (1.95)	14.46 (1.21)	13.37 (1.87)	14.37 (1.08)	14.96 (1.7)	14.09 (2.02)	13.73 (2.11)	13.82 (2.02)	15.68 (0.83)	13.56 (1.45)	13.88 (1.90)
	1322	2982	1421	2656	2451	2472	2190	2665	3194	2923	2580	2319	29175
Age													
	66.82 (9.62)	65.02 (10.66)	64.74 (10.68)	63.84 (10.01)	65.04 (9.65)	64.17 (10.7)	66.76 (10.99)	64.36 (11.16)	64.43 (10.89)	65.63 (9.69)	64.18 (9.93)	64.16 (10.21)	64.82 (10.42)
	1341	3169	1462	2830	2568	2616	2228	2968	3242	2983	2661	2467	30536
Gender													
Male=1	0.41 (0.49)	0.45 (0.50)	0.44 (0.50)	0.42 (0.49)	0.46 (0.50)	0.45 (0.50)	0.45 (0.50)	0.43 (0.50)	0.43 (0.50)	0.45 (0.50)	0.46 (0.50)	0.44 (0.50)	0.44 (0.50)
Female=0	1341	3169	1462	2830	2568	2616	2228	2968	3243	2983	2661	2467	30536
Living with spouse or partner													
yes=1 no=0	0.59 (0.49)	0.71 (0.45)	0.67 (0.47)	0.64 (0.48)	0.76 (0.43)	0.68 (0.47)	0.76 (0.43)	0.66 (0.47)	0.73 (0.44)	0.81 (0.39)	0.77 (0.42)	0.74 (0.44)	0.72 (0.45)
	1341	3169	1462	2830	2568	2616	2228	2968	3243	2983	2661	2467	30536
Child ≤18 years in household													
yes=1 no=0	0.05 (0.21)	0.05 (0.22)	0.07 (0.26)	0.06 (0.24)	0.05 (0.21)	0.08 (0.27)	0.07 (0.25)	0.10 (0.3)	0.06 (0.24)	0.07 (0.26)	0.07 (0.26)	0.20 (0.4)	0.08 (0.26)
	1341	3169	1462	2830	2568	2616	2228	2968	3243	2983	2661	2467	30536
Houshold annual net income €													
	26894 (9838)	31415 (36032)	42371 (38805)	15846 (14058)	34406 (37733)	31638 (21520)	22788 (29447)	37206 (36546)	22314 (23031)	25052 (23807)	41650 (46965)	11577 (11428)	28203 (31480)
	1341	3169	1462	2830	2568	2616	2228	2967	3243	2983	2661	2467	30533

Country	AT	BE	CH	CZ	DE	DK	ES	FR	GR	IT	NL	PL	Total
	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N	Mean (SD) N
Years of education	7.5 (4.97) 1330	11.7 (3.68) 3165	11.11 (4.87) 1451	11.67 (3.03) 2823	12.48 (3.25) 2559	7.95 (5.68) 2608	6.97 (5.07) 2205	11.17 (4.14) 2931	8.49 (4.29) 3188	7.86 (4.38) 2975	11.05 (3.73) 2646	9.2 (3.32) 2461	9.85 (4.57) 30342
Self-perceived health from poor=1 to excellent=5	2.97 (1.03) 1341	3.01 (1.02) 3169	3.4 (1.03) 1462	2.66 (1) 2830	2.8 (1.02) 2568	3.41 (1.17) 2616	2.55 (0.97) 2228	2.81 (1.03) 2967	3.13 (1) 3243	2.7 (1.08) 2983	3.06 (1.04) 2661	2.13 (0.99) 2467	2.9 (1.1) 30535
Global limitation index(GALII) limited=1 non-limited=0	0.13 (0.34) 1341	0.16 (0.36) 3169	0.09 (0.29) 1462	0.19 (0.39) 2830	0.17 (0.37) 2568	0.12 (0.33) 2616	0.07 (0.26) 2228	0.16 (0.36) 2967	0.07 (0.25) 3243	0.13 (0.34) 2983	0.19 (0.39) 2661	0.28 (0.45) 2467	0.15 (0.35) 30535
AT, Austria; BE, Belgium; CH, Switzerland; CZ, Czech Republic; DE, Germany; DK, Denmark; ES, Spain; FR, France; GR, Greece; IT, Italy; NL, Netherlands; PL, Poland													

4.4 Results

4.4.1 Descriptive statistics

As depicted in Table 4.2, on average, 20% of the respondents in our sample is a daily smoker. Greece and France have the highest and the lowest prevalence of daily smokers (29% and 14%), respectively. With regard to health care cost coverage, the Netherlands followed by Spain provide the most generous coverage (similar to our estimations based on OECD data, see Table 4.1). Regarding the demographic factors, on average, our sample is at the age of 65, 44% is men and 72% is living with a spouse or a partner. As expected, the socioeconomic factors vary among the countries included. Annual household net income, adjusted for purchasing power parity, in Poland (11,577 Euro) is almost a quarter of the annual household net income in Switzerland (42,371 Euro). There is also a large difference between countries with regard to the level of education. While respondents in Spain, on average, report 7 years of education, those who live in Germany, report nearly 12.5 years of education. With regard to self-perceived health status, Swiss and Danish people have the highest perceived health status, while people in Poland self-rate their health status, on average, as fair on a scale from poor to excellent.

4.4.2 Health insurance and daily smoking

As noted in the method section, based on marital status, we use two variables to instrument smoking, that is; whether the partner smokes for those who live with a partner (our first model) and whether another household member smokes for those who live without a partner (our second model). For each model, a gender stratified analysis is performed. All results should be interpreted taking into account the fact that our sample primarily consists of individuals aged 50 or over.

As depicted in the first part of Table 4.3 (i.e. second stage regression), the effect of smoking on health care cost coverage is not statistically significant for individuals who live with a partner. However, for those who live without a partner, smoking has a negative impact on health care coverage, that is being a daily smoker decreases health care cost coverage by 2.15 and 2.33 units for women and men, respectively. For a comparison, the results of regressing health care cost coverage on daily smoking using the OLS estimate show coefficients that are not statistically significant (see Appendix F).

However, we observe some differences across the countries based on the results from our analysis per country (see Table 4.4) when compared with the above

all-countries results (see Table 4.3). The first column of Table 4.4 shows for each group the IV estimates of the effect of daily smoking on health care cost coverage per country. As noted earlier, the average effect of smoking on health care cost coverage among women who live with a partner is not statistically significant in the all-countries model (see Table 4.3). However, as reflected in Table 4.4, daily smoking has a negative effect on health care cost coverage among women living with a partner in the Netherlands and the Czech Republic. For men living with a partner, the findings show a considerable negative effect of smoking on health care cost coverage in Spain, Italy, France, Denmark, and Czech Republic (Table 4.4), while at the same time the average effect of smoking in the all-countries model is not statistically significant (see Table 4.3). Among those who live without a partner, our results show an overall negative effect of smoking on health cost coverage for both men and women (Table 4.3). However, referring to the country-specific results, we see a positive effect for women in Poland and for men in Switzerland (Table 4.4).

Table 4.3 *IV estimates*

Model	Second stage regression				First stage regression			
	Living with partner	Living without partner	Female	Male	Living with partner	Living without partner	Female	Male
Dependent variable								
Instrumental variables								
<i>Health care Cost coverage</i>								
If partner smoker					0.691*** (0.035)	0.733*** (0.038)		
If Other household member smoker							0.322** (0.103)	0.269** (0.103)
Instrumented variable								
<i>Daily smoking</i>								
Age	0.128 (0.131)	-0.335 (0.254)	-2.150*** (0.111)	-2.337*** (0.150)				
Years of education	0.006** (0.002)	0.004 (0.003)	-0.022*** (0.003)	-0.024*** (0.004)	-0.036*** (0.002)	0.030*** (0.002)	0.040*** (0.002)	0.033*** (0.003)
LN household income	-0.021*** (0.004)	-0.020*** (0.004)	-0.025*** (0.007)	-0.009 (0.010)	0.007 (0.004)	0.012*** (0.004)	0.007 (0.005)	0.003 (0.006)
If child aged ≤ 18 in the household	0.008 (0.019)	0.011 (0.021)	-0.015 (0.030)	-0.038 (0.045)	-0.002 (0.018)	-0.056** (0.017)	-0.029 (0.025)	-0.038 (0.030)
Self-perceived health	0.033 (0.060)	0.085 (0.059)	0.202 (0.120)	-0.089 (0.190)	-0.121* (0.054)	0.052 (0.048)	-0.091 (0.094)	0.060 (0.122)
Global limitation index(GALI)	-0.005 (0.018)	-0.006 (0.018)	-0.112*** (0.028)	-0.143** (0.045)	-0.057** (0.017)	-0.018 (0.016)	-0.055* (0.023)	-0.068* (0.030)
Austria	0.057 (0.054)	0.026 (0.054)	-0.057 (0.071)	0.131 (0.123)	-0.028 (0.055)	0.022 (0.048)	-0.054 (0.062)	0.088 (0.083)
Belgium	-1.971*** (0.099)	-2.216*** (0.099)	-2.064*** (0.135)	-2.430*** (0.227)	-0.197* (0.096)	-0.100 (0.091)	0.497*** (0.110)	-0.404* (0.158)
Czech Republic	-3.691*** (0.072)	-3.702*** (0.073)	-3.992*** (0.124)	-3.822*** (0.191)	0.375*** (0.069)	0.109 (0.065)	0.393*** (0.100)	-0.248 (0.128)
	-1.189*** (0.076)	-1.172*** (0.079)	-1.409*** (0.123)	-1.386*** (0.191)	0.287*** (0.072)	0.100 (0.070)	-0.293** (0.095)	-0.234 (0.128)

Model	Second stage regression				First stage regression			
	Living with partner		Living without partner		Living with partner		Living without partner	
	Female	Male	Female	Male	Female	Male	Female	Male
Denmark	-1.368*** (0.076)	-1.427*** (0.079)	-1.171*** (0.129)	-1.100*** (0.193)	0.019 (0.070)	0.119 (0.068)	0.148 (0.097)	0.134 (0.126)
France	-1.668*** (0.076)	-1.615*** (0.077)	-1.824*** (0.121)	-1.486*** (0.191)	0.488*** (0.075)	-0.168* (0.071)	0.563*** (0.097)	-0.369** (0.129)
Germany	-2.247*** (0.075)	-2.279*** (0.075)	-2.443*** (0.135)	-2.824*** (0.207)	0.425*** (0.073)	0.092 (0.068)	0.357*** (0.107)	-0.446** (0.141)
Greece	-1.932*** (0.072)	-1.873*** (0.084)	-2.219*** (0.125)	-1.752*** (0.207)	-0.065 (0.065)	0.459*** (0.063)	-0.239* (0.098)	0.176 (0.135)
Italy	-2.038*** (0.071)	-1.919*** (0.073)	-2.048*** (0.137)	-1.590*** (0.216)	0.324*** (0.068)	0.035 (0.065)	-0.310** (0.108)	-0.197 (0.144)
Poland	-2.175*** (0.079)	-2.154*** (0.084)	-2.435*** (0.140)	-1.983*** (0.220)	-0.122 (0.073)	0.262*** (0.071)	-0.281* (0.110)	0.085 (0.143)
Spain	-0.841*** (0.080)	-0.873*** (0.081)	-0.931*** (0.143)	-0.757*** (0.218)	0.632*** (0.084)	0.129 (0.072)	0.658*** (0.128)	-0.009 (0.144)
Switzerland	-2.870*** (0.090)	-2.890*** (0.092)	-2.992*** (0.140)	-3.023*** (0.221)	-0.174* (0.086)	0.042 (0.083)	-0.241* (0.109)	-0.228 (0.150)
Constant	15.401*** (0.274)	15.651*** (0.384)	18.444*** (0.395)	18.836*** (0.590)	1.369*** (0.248)	1.684*** (0.234)	2.443*** (0.315)	2.277*** (0.380)
N	10511	10379	5539	2340	10511	10379	5539	2340

Standard error in parenthesis; * p value≤0.05 ** p value≤0.01 *** p value≤0.001

Table 4.4 *IV estimates per country*

Model	Female with partner		Male with partner		Female without partner		Male without partner	
Stage of regression	Second	First	Second	First	Second	First	Second	First
Dependent variable	Health cost coverage	Daily smoking	Health cost coverage	Daily smoking	Health cost coverage	Daily smoking	Health cost coverage	Daily smoking
Independent variable	smoke	If partner smoker	smoke	If partner smoker	smoke	If other household member smoker	smoke	If other household member smoker
Austria	1.141 (0.640)	1.003*** (0.193)	-0.599 (1.142)	0.941*** (0.205)	0.182 (1.182)	-0.272 (0.670)	1.874 (1.415)	-4.878 (3,029.64)
Germany	0.423 (0.453)	0.96*** (0.129)	-0.376 (0.577)	1.068*** (0.143)	0.272 (0.722)	1.282* (0.537)	-1.996 (1.574)	1.466* (0.578)
Netherland	-0.989*** (0.092)	0.669*** (0.101)	0.19 (0.145)	0.939*** (0.117)	-0.494 (0.290)	0.436 (0.477)	0.441 (0.436)	0.206 (0.394)
Spain	-0.712 (0.51)	0.406* (0.161)	-2.694*** (0.190)	0.108 (0.148)	-2.35*** (0.284)	-0.198 (0.452)	-0.498 (0.768)	-0.5 (0.676)
Italy	0.091 (0.664)	0.628*** (0.112)	-2.536*** (0.319)	0.55*** (0.112)	-3.422*** (0.417)	0.095 (0.400)	-3.403*** (0.495)	-0.423 (0.369)
France	-0.282 (0.629)	0.55*** (0.153)	-3.818*** (0.322)	0.246** (0.123)	0.311 (1.183)	0.293 (0.376)	1.129 (1.063)	0.081 (0.422)
Denmark	-0.19 (0.206)	0.999*** (0.111)	-1.522*** (0.162)	0.614*** (0.104)	0.282 (0.393)	0.616* (0.296)	0.648 (0.477)	0.725* (0.353)

Model	Female with partner			Male with partner			Female without partner			Male without partner		
Stage of regression	Second	First	Second	First	Second	First	Second	First	Second	First	Second	First
Dependent variable	Health cost coverage	Daily smoking	Health cost coverage	Daily smoking	Health cost coverage	Daily smoking	Health cost coverage	Daily smoking	Health cost coverage	Daily smoking	Health cost coverage	Daily smoking
Independent variable	smoke	If partner smoker	smoke	If partner smoker	smoke	If partner smoker	smoke	If partner smoker	smoke	If other household member smoker	smoke	If other household member smoker
Greece	0.189 (1.17)	0.365*** (0.090)	-0.689 (0.85)	0.352*** (0.094)	-1.216 (1.091)	1.476 (0.798)	-3.143*** (0.673)	1.476 (0.798)	-3.143*** (0.673)	5.62 (0.000)	5.62 (0.000)	5.62 (0.000)
Switzerland	0.336 (0.679)	1.005*** (0.177)	-0.386 (0.748)	0.944*** (0.187)	-0.578 (1.051)	6.218 (936.449)	2.067* (0.958)	6.218 (936.449)	2.067* (0.958)	1.057* (0.465)	1.057* (0.465)	1.057* (0.465)
Belgium	-0.404 (0.35)	0.647*** (0.113)	-0.078 (0.272)	0.71*** (0.127)	-1.483*** (0.144)	0.14 (0.347)	-1.214** (0.459)	0.14 (0.347)	-1.214** (0.459)	0.521 (0.374)	0.521 (0.374)	0.521 (0.374)
Czech Republic	-1.686*** (0.197)	0.566*** (0.105)	-1.545*** (0.178)	0.68*** (0.122)	-0.07 (0.309)	0.594* (0.277)	-1.594*** (0.359)	0.594* (0.277)	-1.594*** (0.359)	0.607*** (0.227)	0.607*** (0.227)	0.607*** (0.227)
Poland	0.436 (0.425)	0.388** (0.120)	-0.851 (0.480)	0.402* (0.124)	1.104** (0.523)	-0.537 (0.817)	-0.2 (1.396)	-0.537 (0.817)	-0.2 (1.396)	-1.066 (0.823)	-1.066 (0.823)	-1.066 (0.823)

Standard error in parenthesis; * p value ≤ 0.05 ** p value ≤ 0.01 *** p value ≤ 0.001

Our findings show that the self-assessed health care cost coverage in all countries studied are different from the self-assessed health care cost coverage in the Netherlands (p value <0.001). As results show, all countries included in our analysis provide less health care cost coverage (as assessed by the respondents) than the Netherlands. Among these countries, the lowest self-assessed coverage compared to the Netherlands is observed in Belgium.

The second part of Table 4.3 (i.e. first stage regression) shows the effect of the instrument on smoking behavior. As depicted in that table, having a smoker as a partner increases the probit of daily smoking by 0.691 and 0.733 units for women and men, respectively. However, when living without a partner, having any other daily smoker in the household increases the probit of daily smoking by 0.322 and 0.269 units for women and men, respectively. Our results show the negative effect of age on smoking in all groups (p value <0.001). We find, however, that a one-year increase in education decreases the probit of smoking only among males who live with a partner. The effect of education does not appear statistically significant for the other groups. The same applies for income. Its negative effect on the probit of smoking only appears statistically significant among males who live with a partner (p value <0.01). Our findings show that having any children at age 18 or under in the household, decreases the probit of daily smoking by 0.121 units only among women who live with a partner. It has no effect on the smoking behavior of individuals in the other groups.

With reference to the country-specific results (Table 4.4), having a smoker as a partner increases the probability of daily smoking among women in all countries, although the size of effect is not the same across different countries. The same also applies for men in all countries except Spain where the partner's smoking behavior seemingly has no effect on men's smoking behavior. With regard to the effect of having any other daily smoker in the household on the smoking behavior of women without a partner, the results appear statistically significant in fewer countries (i.e. Germany, Denmark, and Czech Republic). It is also the case for men without a partner in Germany, Denmark, Switzerland, and the Czech Republic who are more likely to be a daily smoker if there is another smoker in the household.

4.4.3 Instrument validity and relevance

An instrumental variable must be relevant, meaning that it should be able to account for a significant variation in the endogenous variable. Intuitively, a strong instrument has a strong association with the endogenous variable. In contrast, a

weak instrument is only marginally relevant. This can be tested by obtaining the F statistics of the instrument in the first stage regression. The widely used rule of thumb suggested by Staiger and Stock (1997) considers an F statistics of more than 10 as indicating a strong enough instrument (Cameron & Trivedi, 2009). As in our analysis the first stage regression is a probit regression, we present the corresponding Chi square test instead of F test in the first column of Table 4.5. These tests are considerably larger than 10 in all models.

Table 4.5 *Instrument quality tests*

Model	Females			Males		
	1	2	3	1	2	3
<i>Living with partner</i>	401.74	0.03	-0.01	397.98	1.88	-.003
<i>Living without partner</i>	15.01	0.50	0.025	11.24	0.01	0.018

(1) The Chi 2 test for the exclusion of the instrument in the first stage equation.

(2) The F test for the exclusion of the instrument in the second-stage equation.

(3) The spearman correlation coefficient between health insurance coverage and the instruments.

An instrument must be valid too, meaning that it should not be correlated with the error term in the original equation. This condition is not possible to test in a just-identified model, such as our model, and should be judged based on information that is extraneous to the data (Morgan & Winship, 2007; Rose & Stone, 2011). However, as done by Trostel, Walker, and Woolley (2002), we conduct a F test of the effect of the instrument on health care cost coverage residual to ensure that the instruments are not directly correlated with the health care cost coverage once the other exogenous variables are included. These are reported in the second column of Table 4.5. As it can be seen, these tests do not appear statistically significant in all models which imply no correlation between the residuals and the instrument. In order to get more insight, we also report the spearman correlation coefficient between health care cost coverage and our instruments. As depicted in the third column of Table 4.5, the correlation coefficients are either zero or very close to zero in all models which show no or very weak correlation between health care cost coverage and our instrument.

4.5 Discussion

4.5.1 Insurance coverage and smoking behavior

The results presented in this chapter show that smoking has negative effect on self-assessed health care cost coverage but only among those who live without a partner. For those who live with a partner, the results are not statistically significant. In other words, among those (men and women) who live without a partner, smoking decreases self-assessed health care cost coverage. It should be emphasized again that our variable of interest for health care cost coverage is a self-assessment of the coverage (i.e. what individuals perceive as health coverage they would have when seeking health care services), and our sample primarily includes individuals aged 50 or over.

By comparison, the IV estimates are much inflated relative to the OLS estimates, even though the latter did not appear to be statistically significant. In fact, the instrument nets out the part of endogenous variable that are correlated with the error term in the population model. One plausible source for this correlation, as mentioned earlier, is reverse causality which is expected not only based on common sense, but also based on the theory of moral hazard. The large difference between IV estimates and OLS estimates might indicate that the reverse causality might be the most important source of endogeneity.

Most of the previous evidence about the effect of smoking on health insurance originated from Australia (Barrett & Conlon, 2003; Doiron et al., 2008; Hopkins & Kidd, 1996). They are mostly correlational studies about the effect of smoking on the demand for private health insurance to see if it is in accordance with the adverse selection effect. However, they show that smokers are less likely to buy insurance, which is contrary to the theoretical expectations based on adverse selection. Those findings have been explained by authors through heterogeneity in risk aversion (Doiron et al., 2008). In other words, they explain that the decision to buy private health insurance and to smoke are jointly determined by risk aversion. Alternatively, it may also be explained by myopic behavior of smokers (Becker et al., 1994). Similar to previous studies, we also find a negative impact of smoking on health care cost coverage but only among those living without a partner. We contribute to previous results, first, by studying this effect among different countries with different institutional arrangements for health care cost coverage. Second, a broader sense of health care cost coverage rather than just health insurance coverage is taken into account. As previously noted, health care cost coverage has three dimensions (i.e. breadth, scope, and depth). In fact, all those

dimensions are simultaneously reflected in the variable we use, since it is a self-assessment of what individuals perceive as health care cost coverage for all health care services, either covered by basic or voluntary private insurance or uninsured services. Our third contribution is to identify a casual effect by using an IV strategy, which has not been done before in studies on this topic.

4.5.2 Adverse selection and European health care systems

Adverse selection occurs when individuals have a choice whether or not to buy health insurance. With choice, a positive relationship between (health) risk and insurance coverage can be expected (Cutler & Zeckhauser, 2000). The same applies when we interpret the negative relationship between (health) risk (e.g. smoking) and insurance by heterogeneity in risk aversion between individuals. In this case, more risk-taking individuals (smokers) are also more likely to take more risk in their health insurance coverage and opt for less coverage. This argument holds even if we consider myopic behavior for smokers. However, one might argue that the health care systems in most European countries are either based on a national health system or social health insurance which restricts the individual's freedom of choice in health insurance. As a result, adverse selection does not exist in a system with compulsory insurance. However, as is also apparent from our results, there is enough variation in health care cost coverage among individuals in the countries in our analysis. Moreover, in many of those countries, there are also private or supplement voluntary health insurance arrangements, in parallel or in addition to national health systems or social health insurance.

Accordingly, we expect to see more effect of smoking on health care cost coverage in countries where there is more choice of health care cost coverage. For instance, in countries where consumers are allowed to choose from multiple insurers or where there is the larger proportion of the population who have some kind of private health insurance. However, our results show that the negative effect of smoking on health insurance coverage is more evident in countries where there are fewer possibilities of choice. For instance, in case of Italy or the Czech Republic we find a considerable negative effect of smoking on health care cost coverage. In contrast, in Germany where there is more choice both for social health insurance and private health insurance, we do not see an effect of daily smoking on health care cost coverage. As previously noted, previous studies have tried to explain the counter-conventional relationship between smoking and health insurance by heterogeneity in risk aversion. However, our results show that the negative effect of smoking on health insurance coverage cannot fully be explained by risk aversion.

Because, we see this effect also in countries where there are fewer possibilities to choose health care cost coverage. One plausible explanation instead of risk aversion can be more out-of-pocket expenditures among smokers in these countries. Further research should test if this is the case.

4.5.3 Self-assessed health and purchasing private health insurance

Previous studies have also found a positive correlation between self-assessed health and purchasing private health insurance in Australia (Doiron et al., 2008). Those who assess themselves as healthier are more willing to purchase private health insurance. In contrast, we find a negative effect of self-assessed health on health care cost coverage but only among those who live without a partner. Thus, among them, a better perceived health decreases the level of health cost coverage. Considering self-perceived health as a proxy for health risk corroborates the notion of adverse selection in the relationship between (health) risk and (health) insurance. Other studies (Doiron et al., 2008) which find, in contrast, a positive relationship between self-assessed health and purchasing private health insurance, conclude that the correlation between self-assessed health status and purchasing private insurance is affected by other factors such as risk aversion, and socioeconomic factors which dominate the conventional adverse selection effect. However, if more objective measures of health status (i.e. the number of chronic diseases) are used, the results are consistent with the adverse selection effect. For instance, they find that those who have a chronic condition are more likely to purchase insurance and less likely to be in a good self-assessed health. These results are compatible with our findings using self-assessed health. Nevertheless, relating these findings to adverse selection should be done with caution for several reasons. First, the effect is only detected among those who live without a partner. This can be explained by heterogeneity in risk aversion between those who live with and without a partner. Second, as also mentioned in previous studies (Doiron et al., 2008), self-assessed health status can be endogenous to the insurance which makes it difficult to infer causality. Regarding the specific country results, in some countries we see a deviation from the general pattern we just discussed. For instance, in the Netherlands, we find a negative effect of self-perceived health on health care cost coverage only for women with a partner while in the Austria we see the same effect among men with a partner and in Italy a positive effect is detected.

4.5.4 Discussion of the study design

Our study differs in several respects from earlier studies. First, it identifies a causal effect of smoking on health insurance coverage which corroborates the counter-conventional relationship found in the previous study but in the language of causality. However, it should be noted that the identification of causality is based on our IV model which has its limitations. It cannot be considered as strong as causality inferred from an experimental design. Second, it allows for a broader sense of health cost coverage to be studied rather than only health insurance coverage. In addition, it takes into account the variation in health care cost coverage between countries and also between individuals within each country. Third, it uses a subjective measure of health care cost coverage, that is what individuals perceive as health care cost coverage. In fact, this perception can express the amount of protection that individuals feel they have when facing risks. This subjective measure of health care cost coverage is more informative about the adverse selection effect than just the probability of having health insurance, because most people intuitively include perceptions in their decision-making process.

Nevertheless, we need to acknowledge some limitations. Although an IV strategy, such as applied in our study, is a common approach to deal with the endogeneity problem and to infer causality, finding a valid instrument is challenging. Given the data at hand, all our efforts failed to find more than one valid instrument. Thus, we ended up with a just-identified model where the instrument's validity is not testable, and it must be relied on information that is extraneous to the estimation approach (Cameron & Trivedi, 2009; Morgan & Winship, 2007). Thus, the extent of the causal interpretation of the results depends on the extent to which the validity of the instrument can be justified. In addition, our instrument (i.e. the other household member's smoking behavior) is limited to the smoking behavior of those household members who are eligible to be included in the study. We do not have information about the smoking behavior of those household members who were not eligible because of their age. For instance, if children are still living with parents, it seems reasonable to assume that their smoking behavior can affect their parents' smoking behavior. But we do not have this information at hand. Nevertheless, the results of the first stage regression show that our instrument is highly relevant.

4.6 Conclusion

In this chapter, we have used for the first time, to our knowledge, an IV strategy to identify a causal effect between smoking and health care cost coverage. Using data from 12 European countries, smoking is instrumented by an instrumental variable indicating whether or not there is any other daily smoker in the household, besides the smokers themselves. For health care cost coverage, a self-assessment of health coverage is used which is based on the individuals' self-assessment of the extent of the health care cost coverage they have for different types of health services. We find that smoking decreases self-assessed health care cost coverage among men and women who live without a partner. In addition, this negative effect is more evident in countries where there is less variation in health care cost coverage.

Thus, these findings, on the one hand, challenge previous studies which have tried to explain a counter-conventional relationship between smoking and the type of insurance through heterogeneity in risk aversion. On the other hand, it can be assumed that the negative effect of smoking on health care cost coverage in those countries might be because of higher out-of-pocket expenditures that a smoker may incur. This assumption needs to be tested by further research. Given that we have only one instrument, testing the overidentifying restrictions is not possible. Although at the outset, we tried to add more instruments, all our effort failed to find more relevant and valid instruments. Further research can also apply the same strategy to different datasets, looking for more than one instrument to identify a causal effect between health care cost coverage and smoking.

Chapter 5

Patient payments and unhealthy behavior: a comparison across European countries

This chapter draws upon:

Rezayatmand, R., Pavlova, M. and Groot, W. (submitted). Patient payment and unhealthy behavior: a comparison across European countries.

Abstract

In a solidarity based health care system, such as those in European countries, costs are incurred by all citizens and not only by those who make the costs. This issue has raised criticism, as it seems unfair that the costs of unhealthy behavior are paid by those who choose to live a healthy life. We contribute to previous research by providing cross-country evidence on the internal medical costs of unhealthy behavior among the elderly.

This chapter addresses two questions: whether or not an unhealthy lifestyle is associated with more utilization of health care and whether the extra cost of more use of health care are paid out of pocket by those who engage in unhealthy behavior (i.e. smoking, alcohol consumption, and obesity). The chapter uses data from the second wave of SHARE for 13 European countries. A sequential logit model is used to analyze use and payments for outpatient and inpatient health care service in addition to a two part model for the analysis of use and payments for prescribed drugs.

We do not find systematic evidence that unhealthy behavior among a population of elderly (aged 50+) is associated with more utilization of health care and more out-of-pocket payments. The most consistent pattern among the elderly in the included countries appears in case of smoking. Former smoking is associated with a higher rate of health care use. In contrast, current smoking is associated with less health care use. The results can be of interest for policies that aim to make people more responsible for their health behavior. Our findings per country can be of use for further studies on the causes of cross-country differences in out-of-pocket payments.

5.1 Introduction

Prior research has documented that unhealthy behavior results in greater health care use and consequently greater health care costs (Dall et al., 2007; Oldridge, 2008; Scarborough et al., 2011; Von Lengerke & John, 2006). In a solidarity-based health care system, like in most European countries, the burden of the costs is incurred by all individuals (citizens), who contribute to the system funding, and not only by those who cause the costs. This issue has been criticized, as it seems unfair that the costs of a choice for an unhealthy behavior are paid for by those who have chosen for a healthy lifestyle (Trappenburg, 2000). Thus, there is an ongoing debate about incorporating some elements of individual responsibility in the health care system and providing incentives for a better health-related behavior (Buyx & Prainsack, 2012; Stegeman, Willems, Dekker, & Bossuyt, 2013). For instance, some studies suggest a carrot and stick approach for this purpose; carrot like the discount in premium for those who have a healthier lifestyle and a stick like a copayment for those who have a medical problem due to their unhealthy lifestyle. There are also some other suggestions like waiting lists for those who have an unhealthy lifestyle (Schmidt et al., 2010).

This debate is based on the expectation that unhealthy behavior increases the use and costs of health care. Many studies have investigated the correctness of this assumption. Sloan, Ostermann, Picone, Conover, and Donald H. Taylor (2004) identify at least 60 studies (mostly in the United States) published between the 1960s and 2002 which solely focused on medical expenditure attributable to smoking. These studies commonly used a top-down approach using data at the population level. At the same time, these studies have mostly looked at the costs of unhealthy behavior from a societal perspective. We could not find studies investigating out-of-pocket expenditure attributable to unhealthy behaviors. For instance, if it can be shown that those who engage in unhealthy behavior and use the health care system more often, also pay more out of their pocket, it means that they have already paid some of their way.

The aim of this chapter is to address the following two questions; first, whether or not an unhealthy lifestyle is associated with more utilization of health care, and second, whether the extra cost, if any, is paid out of pocket by those who engage in an unhealthy behavior or is paid out of a collective pocket. In this chapter, we look at daily smoking, body mass index (BMI), and heavy drinking to proxy health-related behavior. We use individual-level data on the utilization of outpatient and inpatient care as well as data on the utilization of medication from

13 European countries. We contribute to previous research by providing evidence on the internal medical costs of unhealthy behavior among elderly in a broad range of European countries. The results can be of interest for policies that aim to make people more responsible toward their health behavior. The subsequent background section briefly reviews previous studies about the impact of health behavior on the health care use and cost.

5.2 Background

5.2.1 The impact of health-related behavior on health care utilization

Due to well-known adverse health outcomes of unhealthy behavior, it is expected that unhealthy behavior increases health care use and consequently health care costs. A large body of literature has investigated the impact of different types of unhealthy behavior (mostly smoking) on different types of health care utilization. Regarding smoking, previous studies (Vals, Kiivet, & Leinsalu, 2013; Wacker et al., 2013) have shown that current smokers use outpatient care less often than never smokers, but if anything, the number of physician visits are higher for current smokers than for never smokers (Wacker et al., 2013). Another study (Izumi et al., 2001) finds the same results comparing ever smokers (current and ex-smoker) with never smokers. Regarding inpatient care, previous studies report more hospitalization either by current smokers (Izumi et al., 2001), or by former smokers (Wacker et al., 2013) or only among female former smokers (Vals et al., 2013) compared to never smokers. Sloan et al. (2004) show that the effect of smoking on outpatient care use is age-dependent. Smoking increases physician visits before age 51 but it causes a decrease in use subsequently, which is mostly explained by the higher mortality rate of smokers. For inpatient care, Sloan et al. (2004) find that smoking raises hospital utilization in all age groups, although its effect on inpatient care in a lifetime is small.

Some studies have looked at other health-related behaviors too, though there are fewer studies on this than on the effect of smoking. For instance, one study (Vals et al., 2013) has shown that obesity and overweight are strongly related with a higher probability of outpatient visits in both genders and with the probability of hospitalizations in women. This study also found that beer drinking is associated with a lower use of outpatient and inpatient care. However, it also reports that light drinking is associated with an increased use of both outpatient and inpatient care.

5.2.2 The impact of health-related behavior on health care costs

Many studies (mostly cross-sectional) have shown that smoking, obesity, overweight and alcohol consumption lead to more medical expenditure at least in the short run (Barendregt, Bonneux, & van der Maas, 1997; Izumi et al., 2001; Sturm, 2002). However, there is no such consensus about the long run effects of unhealthy behavior on health care costs, particularly in case of smoking. Some studies indicate that the extra costs caused by smokers are compensated for by their higher mortality rate at earlier stages of life than non-smokers, concluding that smoking cessation would lead to increased health care costs due to non-smoker longevity (Barendregt et al., 1997). In contrast, other studies show that in spite of smokers having a shorter life span than non-smokers, total lifetime medical expenditure is still higher among smokers, and it increases with the amount of smoking (Hodgson, 1992). Having calculated the lifetime cost of smoking in a sophisticated way, Sloan et al. (2004) report an extra spending of \$3,757 and \$2,617 on health care services over the life cycle for women and men respectively, who started smoking at the age of 24.

Most studies about the impact of health-related behavior on health care use and costs are correlational studies that fail to measure a causal effect of health behaviors on medical care utilization or costs. One of the exceptions is the work of Cawley and Meyerhoefer (2012) which estimates the impact of obesity on medical care costs using an instrumental variable strategy. They find an increase of \$2,741 in annual medical expenditure due to obesity. Also, most studies use a top-down approach following the tradition of cost of illness studies (Cawley & Ruhm, 2012). This is because previous analyses were more focused on the external costs of unhealthy behavior rather than the costs incurred by the individuals themselves. Nevertheless, studies that have used a bottom-up approach have only collected data on health care utilization at the individual level. The translation of data on health care use to costs is still based on a monetary valuation of health care services. There are few studies that have looked at cost data at an individual level (Wacker et al., 2013).

5.2.3 Internal costs of health-related behavior

Most previous studies have estimated the costs from a societal perspective. Little is known about the amount of costs that are paid by those who cause them. For instance, Manning, Keeler, Newhouse, Sloss, and Wasserman (1989) showed that the smokers in United States pay their way by subsidizing non-smoker's pension

and nursing home payments. However, relatively few studies have investigated the internal medical costs borne by the smokers (i.e. out-of-pocket payments). Jorm, Shepherd, Rogers, and Blyth (2012) found that current smokers in Australia were around 10% less likely than never smokers to make any out-of-pocket spending. They also found that those current smokers are less likely to use primary care services that incurred out-of-pocket costs.

5.3 Methods

5.3.1 Data and study population

This chapter uses the second wave of SHARE data. This wave was conducted in 2006-2007 in 14 European countries namely; Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Czech Republic, Poland, and Ireland (see Chapter 1, section 1.6). We exclude Ireland because the imputed variables generated by SHARE were not available for that country. Thus, overall, our sample size consists of 33281 respondents from 13 countries.

5.3.2 Out-of-pocket expenditures

In the second wave of SHARE one part of the questionnaire is devoted to out-of-pocket expenses where the following question is asked (see Appendix A): “Not counting your health insurance premium or reimbursements from employers, about how much did you pay out of pocket for your outpatient care in last twelve months?” The same question is asked for inpatient care and prescribed drugs. The respondents are instructed to consider as out-of-pocket payments every expense that is not covered by their health insurance: for outpatient care (i.e. all expenses for consultations for all health professionals including dentists, for all labs, exam, or therapies prescribed by doctor, and for outpatient surgery); for inpatient care (i.e. all expenses for staying in medical, surgical, psychiatric or in any other specialized wards); and for their prescribed drugs (not including self-medication or drugs not prescribed by a doctor). For these variables, we use imputed values generated by SHARE. For each variable five imputed values are provided. The median of the imputed values is used. All amounts in local currencies are converted to Euro using nominal exchange rate corresponding to the year of interview.

5.3.3 Analytical model

Out-of-pocket payments are an outcome of a consecutive process. At the first sequence, the service should be used, then the payment should be made and subsequently the amount of payment should be determined. Therefore, a sequential logit model is used to study the association between health behaviors (i.e. smoking, alcohol consumption, and obesity) and the odds ratios of passing through each transition from utilization of outpatient and inpatient care to the size of out-of-pocket payments for these services (Figure 5.1).

Figure 5.1 *Sequential logit for outpatient and inpatient out-of-pocket payment*

Figure 5.2 *Two part model for prescribed drug out-of-pocket payments*

For prescribed drugs, we are not able to distinguish between the service use and the payment for that service as we do for outpatient and inpatient care. Thus, a two part model is used to model the probability of payment at first and then the amount of payment for those who paid (Figure 5.2). Three models are estimated: for outpatient care, for inpatient care and for prescribed drugs. The analyses are done jointly for all countries as well as separately for each country.

5.3.4 Health behaviors

Indicators of smoking, alcohol consumption, and overweight or obesity are included in the models as independent variables. For smoking, current and former daily smokers are compared with those who had never smoked daily for a period of at least one year (reference group). Alcohol consumption is assessed using the question about the frequency of excessive alcohol use in the last three months. Excessive alcohol use is defined as drinking more than two glasses of any alcoholic beverage (e.g. beer, cider, wine, spirits or cocktails) almost every day or five or six times a week). Respondents are categorized into three groups: excessive alcohol users, not excessive alcohol users and those who had never drank in the past 3 months (reference group). Weight problems are measured on the basis of body

mass index (BMI) calculated from self-reported height and weight. Respondents are classified into three categories: obese ($\text{BMI} \geq 30$), overweight ($25 \leq \text{BMI} < 30$) and those with $\text{BMI} < 25$ (reference group).

5.3.5 Other explanatory variables

All models control for age, gender, living with spouse or partner, years of education, household size, annual household net income quartile, the number of chronic disease, the number of symptoms and a dummy variable indicating the self-perceived health status (very good or excellent, less than very good or excellent). SHARE asks the individual when deciding about making an investment if they are willing to take a substantial, above average, or average financial risk to earn a substantial, above average, or average return; or if they are not willing to take any financial risk at all. We use the answer to this question as a proxy for risk aversion. The reference group is those who said that this question is not applicable to them to represent the most risk-averse individuals.

5.4 Results

5.4.1 Descriptive statistics

The sample characteristics are presented in Table 5.1. It should be noted that all results presented below refer to the elderly population (aged 50+). Of all participants, 20% are current daily smokers, 28% former daily smokers, and 52% never smokers. Greece and France have the highest and the lowest prevalence of current smokers (29% and 14% respectively). The Netherlands and Greece have the highest and the lowest proportion of former smokers (40% and 17% respectively). Austria and the Netherlands have the highest and the lowest proportion of never smokers (65% and 37% respectively). Of all participants, nearly 7% are heavy drinkers, 62% occasional drinkers, and 31% never drinkers. The highest prevalence of heavy drinking is reported in the Netherlands and Belgium (11%), and the lowest prevalence is in Sweden (1.5%). Denmark and Sweden have the highest proportion of occasional drinkers (about 81%), and Spain has the lowest proportion (37%). Spain has the highest proportion of never drinkers (57%), and Denmark has the lowest one (8%). Weight problems appear the most prevalent unhealthy behavior as only 37% of all respondents report a normal weight. About 19% of all respondents are obese and 42% are overweight. Obesity is most prevalent in Poland and Spain (nearly 25% of the participants in these countries).

Overweight is most prevalent in Greece (47.5%). Switzerland has the highest number of individuals whose weight is in the normal range while Spain has the lowest number (47.5% versus 27%).

The annual out-of-pocket payments – if any – for outpatient care, inpatient care, and prescribed drugs are, on average, €320, €509, and €200, respectively. The highest amount of out-of-pocket payments for outpatient care are reported in Switzerland (€700), for inpatient care in Greece (€1878), and for prescribed drugs in Poland (€333). The lowest amounts of out-of-pocket payments for these three services are reported in the Czech Republic.

5.4.2 Outpatient out-of-pocket payments

Table 5.2 presents the results of a sequential logit for out-of-pocket payments for outpatient care. As mentioned in the methods section, the model estimates the odds ratio of passing three transitions: whether or not the service is used, whether or not an out-of-pocket payment is made, and whether a high or a low amount is paid.

Table 5.1 *Health-related behavior and out-of-pocket payments (OOP)*

Country	AT	BE	CH	CZ	DE	DK	ES	FR	GR	IT	NL	PL	SE	Total
Daily smoking														
Current (%)	15.4	17.5	18.8	21.2	16.8	26.4	15.4	13.8	28.9	17.0	22.3	25.7	14.5	19.8
Former (%)	20.2	31.3	25.2	18.8	27.0	35.2	21.2	28.8	17.1	26.0	40.4	28.4	36.1	27.9
Never (%)	64.4	51.3	56.0	60.0	56.2	38.4	63.4	57.4	54.1	57.0	37.3	45.9	46.4	52.3
n	1199	3139	1450	2801	2529	2570	2200	2922	3231	2969	2605	2448	2713	32776
Alcohol consumption														
Heavy (%)	3.5	10.8	6.9	4.0	4.7	10.2	5.6	10.2	5.1	8.6	10.8	1.7	1.4	6.6
Light (%)	65.1	68.1	78.9	55.7	72.9	81.6	37.1	63.6	52.7	45.7	65.5	50.5	81.0	62.3
Not at all (%)	31.3	21.2	14.3	40.4	22.4	8.2	57.3	26.3	42.2	45.7	23.7	47.9	17.6	31.1
n	1331	3138	1445	2797	2539	2558	2217	2905	3236	2975	2619	2448	2705	32913
Body Mass Index														
BMI ≥ 30	24.5	18.9	12.8	24.2	17.7	14.6	25.0	16.0	20.2	18.5	14.9	25.7	16.0	19.0
25 $\leq$ BMI <30	38.4	40.5	37.1	46.8	44.8	38.3	47.4	38.1	47.5	44.5	41.4	41.0	39.4	42.3
18.5 $\leq$ BMI <25	35.0	38.3	47.4	28.2	36.7	44.8	26.6	43.8	31.7	36.1	42.5	31.9	42.1	37.2
BMI <18.5	2.2	2.2	2.7	0.7	0.8	2.4	1.1	2.2	0.6	0.9	1.3	1.4	2.5	1.5
n	1160	3070	1433	2769	2491	2549	2016	2840	3215	2912	2526	2425	2682	32088
Outpatient OOP (€)¹														
Mean	330	176	698	84	137	392	489	247	322	605	378	123	273	320
SD	546	601	2056	155	479	950	974	542	619	1432	788	248	2631	1477
n	178	1866	900	246	1477	923	207	391	1450	1010	446	158	2306	11558
Inpatient OOP (€)¹														
Mean	229	623	1128	75	159	918	934	476	1878	1639	233	127	76	509
SD	485	2227	3027	94	262	780	1438	1279	3252	3125	290	186	120	1763
n	235	407	110	34	330	5	24	125	134	46	12	40	331	1833
Prescribed drug OOP (€)¹														
Mean	199	282	204	61	115	242	166	116	185	260	135	333	179	200
SD	291	395	455	105	216	342	414	201	303	1215	213	2914	2154	1226
n	1070	2590	756	2184	1825	1709	608	912	2225	1973	376	1958	2030	20216

¹ Out-of-pocket payments if made

As depicted in Table 5.2, current smokers are less likely ($OR=0.72$) than never smokers to use outpatient care. However, there is no statistically significant difference between current smokers and never smokers in terms of out-of-pocket payments. Former smokers are more likely ($OR=1.15$) than never smokers to use outpatient care. They are also more likely ($OR=1.10$) to pay higher amounts than never smokers if any out-of-pocket payment is made, although the odds ratio of making out-of-pocket payments is not statistically significant. Heavy drinkers are less likely ($OR=.73$) than never drinkers to use outpatient care. For out-of-pocket payments, the results do not show statistically significant differences between heavy drinkers and never drinkers. However, light drinkers are more likely ($OR=1.17$) to pay out of pocket in case of using outpatient care, although they are as likely as never drinkers to use outpatient care. The findings related to obesity and overweight do not appear statistically significant.

5.4.3 Inpatient out-of-pocket payments

Table 5.3 presents, in turn, the odds ratios for whether or not an inpatient care service is used, whether or not an out-of-pocket payment is made, and whether a high or a low amount is paid.

Former smokers are more likely ($OR=1.37$) to use inpatient care than never smokers but when they use the service, there is not statistically significant difference in terms of out-of-pocket payments. In contrast, both heavy and light drinkers are less likely ($OR=0.53$ and $OR=0.70$, respectively) than never drinker to be hospitalized. Obese and overweight individuals are also less likely ($OR=0.88$ and $OR=0.90$, respectively) to use inpatient care than those with normal weight.

Table 5.2 *Results of Sequential logit for outpatient out-of-pocket payment*

	Either used or not			Either paid or not			Either paid high or low amount		
	OR	95%CI		OR	95%CI		OR	95%CI	
		L	U		L	U		L	U
Daily smoking									
Current smoker	0.72**	0.66	0.79	0.93*	0.86	1.01	1.01	0.90	1.14
Former smoker	1.15**	1.05	1.26	1.07*	0.99	1.15	1.10*	1.00	1.21
Alcohol consumption									
Not excessive alcohol use	0.97	0.89	1.06	1.17**	1.09	1.26	0.94	0.84	1.04
Excessive alcohol use	0.73**	0.63	0.85	1.02	0.90	1.17	1.02	0.84	1.24
Body mass index									
Overweight	1.06	0.98	1.15	1.02	0.95	1.09	0.98	0.89	1.07
Obese	0.98	0.88	1.09	0.93+	0.85	1.01	1.03	0.91	1.15
Age	1.01**	1.01	1.01	0.99**	0.99	1.00	1.00	1.00	1.01
Female	1.36**	1.26	1.47	1.17**	1.10	1.26	1.11*	1.02	1.22
Living with partner	0.94*	0.89	1.00	0.95*	0.91	1.00	1.03	0.96	1.10
Years of education	1.02**	1.01	1.03	1.03**	1.02	1.04	1.03**	1.02	1.04
Willingness to take:									
Substantial financial risk	1.17	0.81	1.71	0.86	0.60	1.22	1.22	0.77	1.93
Above average financial risk	1.25*	1.03	1.50	1.38**	1.13	1.68	1.16	0.96	1.40
The average financial risk	1.12+	0.99	1.26	1.33**	1.20	1.47	1.21**	1.06	1.38
Not willing to take any	1.04	0.95	1.13	1.05	0.97	1.13	1.00	0.90	1.10
Household size	0.91**	0.88	0.95	0.95*	0.92	0.99	0.98	0.93	1.04
Annual household net income									
1 th quartile	0.80**	0.71	0.89	0.96	0.87	1.06	0.80**	0.69	0.91
2 th quartile	0.99	0.89	1.10	1.13**	1.03	1.24	0.85**	0.76	0.96
3 th quartile	1.08	0.98	1.19	1.06	0.97	1.15	0.91+	0.81	1.01
Household net asset									
1 th quartile	0.88*	0.79	0.98	0.84**	0.76	0.92	0.87*	0.76	0.98
2 th quartile	0.97	0.88	1.07	0.93*	0.85	1.01	0.91	0.81	1.02
3 th quartile	0.97	0.88	1.07	1.02	0.94	1.11	0.99	0.88	1.10
Self-perceived health	1.60**	1.48	1.73	1.07+	0.99	1.16	1.35**	1.23	1.49
Number of chronic diseases	1.97**	1.87	2.07	1.00	0.97	1.03	1.14**	1.09	1.18
Number of symptoms	1.27**	1.23	1.32	1.02*	1.00	1.04	1.10**	1.07	1.13
Country dummies ¹									
Austria	1.88**	1.48	2.38	0.81+	0.65	1.01	1.38	0.91	2.08
Belgium	2.87**	2.40	3.44	7.18**	6.26	8.24	1.01	0.80	1.26
Czech republic	2.29**	1.92	2.74	0.44**	0.37	0.52	0.88	0.63	1.23
Denmark	1.11	0.95	1.30	2.27**	1.96	2.63	1.10	0.85	1.42
France	3.98**	3.25	4.87	0.69**	0.59	0.81	0.94	0.70	1.26
Germany	2.22**	1.86	2.66	6.88**	5.96	7.94	2.13**	1.68	2.70
Greece	1.06	0.91	1.23	5.47**	4.74	6.32	1.18	0.93	1.51
Italy	1.57**	1.33	1.85	3.02**	2.61	3.48	1.05	0.82	1.35
Poland	0.65	0.55	0.76	0.39**	0.31	0.47	1.07	0.72	1.60
Spain	1.65**	1.37	1.99	0.60**	0.49	0.73	1.29	0.89	1.89
Sweden	0.81**	0.70	0.95	72.99**	58.54	91.01	1.00	0.80	1.26
Switzerland	1.50**	1.25	1.80	9.60**	8.10	11.37	1.27+	0.99	1.64

¹With reference to Netherlands

** significant at 1% level, * significant at 5% level, + significant at 10% level

Table 5.3 *Results of Sequential logit for inpatient out-of-pocket payment*

	Either used or not			Either paid or not			Either paid high or low amount		
	OR	95%CI		OR	95%CI		OR	95%CI	
		L	U		L	U		L	U
Daily smoking									
Current	1.01	0.91	1.12	0.85	0.65	1.11	1.06	0.77	1.44
Former	1.37**	1.27	1.49	0.94	0.76	1.16	1.03	0.82	1.30
Alcohol consumption									
Not excessive alcohol use	0.70**	0.65	0.76	1.14	0.94	1.38	0.93	0.74	1.17
Excessive alcohol use	0.53**	0.45	0.62	1.38	0.90	2.13	1.04	0.63	1.72
Body mass index									
Overweight	0.88**	0.82	0.95	0.99	0.82	1.21	0.95	0.77	1.19
Obese	0.90*	0.82	0.99	0.86	0.68	1.09	0.93	0.71	1.23
Age	1.01**	1.01	1.01	1.00	0.99	1.01	1.01+	1.00	1.02
Female	0.78**	0.73	0.85	0.99	0.81	1.21	0.84	0.68	1.04
Living with partner	1.02	0.97	1.07	0.99	0.86	1.12	1.00	0.86	1.17
Years of education	1.01+	1.00	1.02	1.03*	1.00	1.06	0.98	0.96	1.01
Willingness to take:									
Substantial financial risk	0.77	0.49	1.21	3.58*	1.11	11.56	0.52	0.14	1.86
Above average financial risk	1.00	0.81	1.24	1.21	0.59	2.48	1.22	0.72	2.06
The average financial risk	0.99	0.87	1.11	1.27	0.93	1.75	1.02	0.71	1.45
Not willing to take any	0.98	0.90	1.07	1.14	0.92	1.42	0.79+	0.62	1.01
Household size	0.97	0.94	1.01	1.01	0.91	1.12	1.11	0.95	1.29
Annual household net income									
1 th quartile	0.95	0.84	1.06	1.02	0.76	1.38	0.90	0.64	1.26
2 th quartile	0.99	0.90	1.10	1.16	0.88	1.52	0.73*	0.53	0.99
3 th quartile	1.05	0.95	1.16	1.29+	0.99	1.67	0.81	0.60	1.09
Household net asset									
1 th quartile	0.98	0.89	1.09	0.92	0.71	1.20	0.93	0.69	1.26
2 th quartile	0.92	0.83	1.02	1.07	0.82	1.39	0.83	0.62	1.11
3 th quartile	0.90*	0.82	1.00	1.00	0.77	1.30	0.82	0.61	1.11
Self-perceived health	2.09**	1.88	2.32	1.01	0.76	1.35	1.10	0.82	1.49
Number of chronic diseases	1.22**	1.19	1.26	1.01	0.94	1.08	1.08+	1.00	1.17
Number of symptoms	1.17**	1.15	1.20	1.05*	1.00	1.10	0.99	0.94	1.04
Country dummies ¹									
Austria	2.45**	2.01	3.00	78.60**	40.63	152.05	0.84	0.25	2.77
Belgium	1.36**	1.15	1.60	90.02**	48.24	168.00	0.81	0.25	2.62
Czech republic	1.18+	0.99	1.39	1.81+	0.91	3.60	0.94	0.24	3.66
Denmark	1.23*	1.03	1.48	0.25*	0.08	0.80	2.19	0.17	28.10
France	1.14	0.96	1.35	9.15**	4.92	17.04	0.97	0.29	3.27
Germany	1.41**	1.19	1.68	82.51**	43.81	155.41	0.92	0.28	2.98
Greece	0.57**	0.47	0.69	33.01**	17.26	63.14	1.01	0.30	3.42
Italy	1.02	0.86	1.21	2.93**	1.50	5.74	0.69	0.19	2.55
Poland	1.01	0.85	1.21	2.46**	1.25	4.87	0.67	0.18	2.55
Spain	0.93	0.77	1.13	2.19*	1.03	4.66	0.80	0.19	3.42
Sweden	1.12	0.93	1.34	354.04**	168.46	744.08	0.79	0.24	2.58
Switzerland	1.40**	1.13	1.73	35.77**	18.48	69.24	0.90	0.27	3.05

¹With reference to Netherlands

** significant at 1% level, * significant at 5% level, + significant at 10% level

5.4.4 Prescribed drug out-of-pocket payments

Table 5.4 presents the results of the two part model for the out-of-pocket payments for prescribed drugs. As previously noted, the first part is a logit model estimating

the odds of out-of-pocket payments. The second part is a log-linear model estimating the amount of out-of-pocket payments.

Current smokers are less likely than never smokers ($OR=0.81$) to make out-of-pocket payments for prescribed drugs. The odds of making out-of-pocket payments are not statistically different for former and never smokers. However, former smokers, on average, incur 6% more out-of-pocket expenditure than never smokers do. The odds of out-of-pocket payments are not statistically significant for heavy and light drinkers but if any payment has been made, light and heavy drinking are associated with a 21% and 26% decrease in the amount of out-of-pocket payments compared with never drinkers. Those who are overweight are more likely to pay out of pocket for prescribed drugs. However, it has no effect on the amount of payment. In contrast, being obese is not related to the odds of an out-of-pocket payment, while in case of payment size, it increases the amount of out-of-pocket payments by 7%.

5.4.5 Per-country analysis

The stratified regression analysis by country shows some differences compared with the aggregate results presented above. Specifically, as depicted in Table 5.5, light drinkers in Germany ($OR=0.61$), Spain ($OR=0.71$), and Poland ($OR=0.68$) are less likely but those who in Greece ($OR=1.39$) are more likely to use outpatient care than never drinkers. In France and Poland, overweight appears to be associated with higher odds ($OR=1.83$, $OR=1.47$, respectively) of outpatient care use.

However, in Sweden obesity is associated with lower odds of outpatient care use ($OR=0.62$). In contrast, in Poland, it is associated with higher odds of outpatient care use ($OR=1.42$). The results of the per-country analysis also show that current smokers in Austria, the Netherlands and Poland are less likely ($OR=0.37$, 0.71 , and 0.58 , respectively) and former smokers in Italy and Belgium are more likely ($OR=1.36$ and 1.24 , respectively) to pay out of pocket for outpatient care. In the Netherlands and Switzerland heavy drinkers are more likely ($OR=1.73$ and 2.62 , respectively) to pay out of pocket while in Greece and Belgium they are less likely ($OR=0.58$ and 0.73 , respectively) to do so. In Sweden and Belgium, overweight is associated with higher odds of out-of-pocket payments for outpatient care ($OR=1.62$ and 1.37 , respectively). However, in Italy, Denmark and Czech Republic obesity is associated with lower odds of out-of-pocket payments ($OR=0.77$, 0.75 , and 0.66 , respectively). In contrast, in Belgium it is associated with higher odds of out-of-pocket payments. Regarding the amount of out-of-pocket

payments, the only statistically significant results are observed in Denmark for former smokers (OR=1.53) and in Switzerland for light drinkers (OR=0.59).

Table 5.4 *Two part model for prescribed drug out-of-pocket payments*

	First part: logit			Second part: log transformation		
	Either paid or not			The amount of OOP (log)		
	OR	95%CI		Coeff	95%CI	
		L	U		L	U
Daily smoking						
Current smoker	0.81**	0.75	0.87	0.00	-0.04	0.04
Former smoker	1.04	0.97	1.11	0.06**	0.03	0.10
Alcohol consumption						
Not excessive alcohol use	1.04	0.97	1.11	-0.21**	-0.25	-0.17
Excessive alcohol use	0.95	0.85	1.08	-0.26**	-0.33	-0.19
BMI						
Overweight	1.10**	1.04	1.17	0.02	-0.02	0.05
Obese	1.08+	1.00	1.17	0.07**	0.03	0.12
Age	1.00**	1.00	1.01	0.01**	0.01	0.01
Female	1.33**	1.25	1.41	0.03+	0.00	0.07
Living with partner	0.94**	0.90	0.98	-0.02	-0.04	0.00
Years of education	1.03**	1.03	1.04	0.01**	0.01	0.02
Willingness to take:						
Substantial financial risk	1.27	0.93	1.73	0.05	-0.13	0.22
Above average financial risk	1.18*	1.01	1.37	-0.01	-0.10	0.07
The average financial risk	1.24**	1.13	1.36	-0.04	-0.09	0.02
Not willing to take any	1.15**	1.08	1.23	-0.02	-0.06	0.02
Household size	0.94**	0.91	0.97	-0.01	-0.03	0.00
Annual Household net income						
1 th quartile	0.91*	0.83	0.99	-0.07**	-0.12	-0.02
2 th quartile	1.01	0.93	1.09	-0.06**	-0.11	-0.01
3 th quartile	1.09*	1.01	1.17	-0.02	-0.06	0.02
Household net asset						
1 th quartile	1.05	0.97	1.14	-0.09**	-0.13	-0.04
2 th quartile	1.10*	1.02	1.19	-0.05*	-0.09	0.00
3 th quartile	1.07+	0.99	1.15	-0.05*	-0.09	-0.01
Self-perceived health	1.92**	1.80	2.05	0.33**	0.29	0.37
Number of chronic disease	1.47**	1.42	1.51	0.19**	0.18	0.20
Number of symptoms	1.12**	1.10	1.14	0.09**	0.08	0.10
Country dummies ¹						
Austria	31.19**	25.48	38.18	0.69**	0.56	0.82
Belgium	31.70**	27.21	36.93	0.88**	0.77	1.00
Czech republic	21.46**	18.44	24.98	-0.70**	-0.82	-0.58
Denmark	14.80**	12.75	17.18	0.79**	0.67	0.91
Germany	16.23**	13.98	18.85	0.08	-0.04	0.20
Greece	18.80**	16.24	21.75	0.69**	0.57	0.80
France	2.30**	1.99	2.66	-0.02	-0.15	0.11
Italy	12.92**	11.16	14.95	0.62**	0.50	0.74
Poland	22.80**	19.39	26.81	0.72**	0.60	0.84
Spain	2.17**	1.85	2.55	0.34**	0.20	0.49
Sweden	22.21**	19.05	25.90	0.56**	0.44	0.68
Switzerland	9.12**	7.75	10.73	0.75**	0.62	0.88
Constant				2.90**	2.70	3.10

¹With reference to Netherlands

** significant at 1% level, * significant at 5% level, + significant at 10% level

We also observe some country-specific results regarding prescribed drugs. As depicted in Table 5.6, the odds of out-of-pocket payments for prescribed drugs appear to be statistically significant not only for smoking and being overweight but for other behaviors in some countries. Specifically, in Greece (OR=1.22) and Switzerland (OR=1.61), light drinking is associated with higher odds (OR=1.22 and 1.61, respectively) but in Czech Republic and Poland with lower odds (OR=0.70) of out-of-pocket payments for prescribed drugs. In Greece, Belgium, and Poland obesity is associated with higher odds of out-of-pocket payments for prescribed drugs (OR=1.31, 1.54, and 1.72, respectively). Regarding the amounts of out-of-pocket payments for prescribed drugs, the results are not statistically significant for current smoking and obesity in aggregate models.

Table 5.5 *Per-country analysis for outpatient out-of-pocket payments*

Country	AT	BE	CH	CZ	DE	DK	ES	FR	GR	IT	NL	PL	SE
Service use	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR
(0=no;1=yes)													
Current smoker	0.47**	0.55**	0.84	0.59**	0.63*	0.65**	0.87	0.77	0.98	0.74+	0.80	0.50**	0.82
Former smoker	1.23	0.93	1.01	1.12	1.17	1.06	1.31	1.08	1.33+	1.15	1.32*	0.84	1.30*
Light alcohol consumption	1.36	1.20	0.75	0.83	0.61*	0.91	0.71*	1.24	1.39**	1.09	1.06	0.68**	0.90
Heavy alcohol consumption	1.96	0.84	0.50+	0.54	0.31**	0.96	0.84	0.52*	0.62*	1.04	0.91	0.46**	1.17
Overweight	0.97	1.06	0.85	1.26	1.01	1.00	0.99	1.83**	1.00	1.22	0.90	1.47**	0.85
Obese	0.84	1.04	0.65+	1.04	1.07	1.35	0.72	1.59	0.87	1.09	1.02	1.42*	0.62**
Payments													
(0=no;1=yes)													
Current smoker	0.37*	1.03	1.31	0.89	1.15	0.78+	1.16	1.24	0.98	0.92	0.71*	0.58*	0.89
Former smoker	0.77	1.24*	1.09	1.25	1.15	1.05	1.38	1.05	0.90	1.36**	0.84	0.65+	0.82
Light alcohol consumption	0.81	0.86	2.16**	1.58**	1.66**	1.22	1.00	1.27	0.93	1.27*	1.47*	1.23	1.28
Heavy alcohol consumption	0.73	0.73*	2.62**	1.48	1.06	1.07	0.93	0.90	0.58*	1.17	1.73*	1.22	2.16
Overweight	1.01	1.37**	1.11	0.82	1.06	0.82*	1.14	1.02	1.04	0.92	0.89	0.67+	1.62*
Obese	1.04	1.37**	0.86	0.66*	0.96	0.75*	0.61+	0.92	0.96	0.77*	0.98	0.96	1.13
High payments													
(0=no;1=yes)													
Current smoker	0.87	0.88	0.94	1.93	0.79	1.18	1.26	0.80	1.20	1.06	0.84	1.07	1.22
Former smoker	1.29	0.88	1.09	1.43	1.07	1.53*	2.09	1.17	1.11	0.87	1.08	0.90	1.16
Light alcohol consumption	1.33	0.92	0.59*	0.56+	1.14	0.78	0.98	0.82	0.86	1.08	1.04	-----	1.12
Heavy alcohol consumption	0.36	1.18	0.82	3.12	1.09	0.81	2.79	1.12	1.08	0.66	1.49	-----	1.11
Overweight	0.92	0.91	0.75+	0.56+	0.94	0.99	1.33	0.89	1.19	1.00	1.23	2.21	1.11
Obese	0.87	0.93	0.53*	0.39*	1.27	1.10	1.61	1.85+	1.52*	1.46+	0.55+	0.99	0.96

** Significant at 1% level, * significant at 5% level, + significant at 10% level

AT, Austria; BE, Belgium; CH, Switzerland; CZ, Czech Republic; DE, Germany; DK, Denmark; ES, Spain; FR, France; GR, Greece; IT, Italy; NL, Netherlands; PL, Poland; SE, Sweden

Table 5.6 *Per-country analysis for prescribed drug out-of-pocket payments*

	AT	BE	CH	CZ	DE	DK	ES	FR	GR	IT	NL	PL	SE
	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR
Payments (0=no;1=yes)													
Current smoker	0.75	0.91	1.03	0.63**	0.76*	0.92	0.80	0.72*	1.06	0.87	0.63**	0.57**	0.77+
Former smoker	1.18	1.09	1.11	0.87	0.99	1.04	1.21	0.92	1.29+	0.85	1.09	0.92	1.04
Light alcohol consumption	1.34	0.89	1.61**	0.70**	1.17	0.74	1.00	1.18	1.22*	1.08	1.04	0.70**	0.92
Heavy alcohol consumption	1.93	0.85	1.51	0.56*	0.83	0.73	1.14	1.38+	0.78	0.93	1.18	0.35**	1.43
Overweight	1.20	1.20	1.12	1.14	1.00	1.15	1.26+	0.99	1.05	1.16	0.79+	1.51**	1.01
Obese	1.07	1.54*	0.87	1.33+	1.33+	1.07	0.88	0.87	1.31*	0.92	0.78	1.72**	1.09
Linear log transformation													
Current smoker	0.03	0.06	0.05	-0.01	0.16*	-0.01	0.12	-0.04	-0.06	0.08	-0.09	-0.09	0.06
Former smoker	0.11	0.13*	0.10	-0.05	0.10+	0.09	0.34*	0.14	0.12*	0.06	-0.27	0.07	0.01
Light alcohol consumption	0.00	-0.20**	-0.22+	-0.44**	-0.11+	-0.28**	-0.13	-0.32**	-0.07	-0.07	-0.33+	-0.33**	0.02
Heavy alcohol consumption	-0.10	-0.08	-0.39*	-0.24+	-0.31*	-0.49**	-0.23	-0.40*	-0.09	-0.15	-0.55*	-0.83**	0.19
Overweight	-0.02	0.04	0.04	0.07	-0.03	0.06	-0.23+	0.03	-0.01	-0.06	-0.42	0.14*	0.13**
Obese	0.10	0.00	0.19	0.16**	0.10	-0.11	-0.03	0.12	0.01	0.04	-0.05	0.28**	0.20**

** Significant at 1% level, *significant at 5% level, +significant at 10% level

AT, Austria; BE, Belgium; CH, Switzerland; CZ, Czech Republic; DE, Germany; DK, Denmark; ES, Spain; FR, France; GR, Greece; IT, Italy; NL, Netherlands; PL, Poland; SE, Sweden

However, as depicted in the second part of Table 5.6, in Germany current smoking is associated with a higher amount of out-of-pocket payments. In Germany and Poland, overweight is associated with a higher amount of out-of-pocket payments, while in Spain it is associated with lower amount of out-of-pocket payments.

5.5 Discussion

In this chapter, we have employed a sequential logit model to investigate how the utilization of outpatient and inpatient care and out-of-pocket payments for them is associated with health-related behavior. We also use a two part model to study the association between out-of-pocket payments for prescribed drugs and health-related behavior. As our sample only includes individuals aged 50 and over, our results cannot be generalized to other age groups. Our study is also not able to distinguish between those services that require out-of-pocket payments and those that do not. Instead, we use a retrospective approach among those who used a service to investigate to what extent out-of-pocket payments for those services can be associated with individuals' unhealthy behavior. Despite these limitations, we contribute to current research by adding new figures to the sparse evidence on the internal costs of an unhealthy behavior, i.e. the cost that is borne by the individuals themselves. These costs can be of more importance for policies about holding people more responsible toward their health-related behavior, as they are those costs that are internally perceived.

5.5.1 Health related behavior and health care utilization

Our results do not confirm that unhealthy behavior is systematically associated with more health care utilization. However, the common pattern in most counties included in our study is a higher rate of inpatient use by former smokers. Previous studies have also shown a higher rate of hospitalization for former smokers but in contrast to our study, also for current smokers (Izumi et al., 2001; Sloan et al., 2004). Regarding outpatient care, our findings comply with previous findings. Sloan et al. (2004) also show a lower physician visit rate for current smokers at age 50 plus than never smokers in United States. Izumi et al. (2001), having considered current and former smokers together as one group of smokers, find that Japanese smokers use outpatient care less often than never smokers. Their study was not limited to the elderly. Wacker et al. (2013) using data from Germany, find that current

smokers are less likely to use outpatient care but if anything the rate of physician visits is higher among them compared to never smokers.

Lower utilization by current smokers has been attributed to their lower concerns about their health status or the fact that smokers might be less risk-adverse individuals (Izumi et al., 2001). It means that smokers usually seek health care services at a later stage of their disease, or even after the time that a disease had forced them to quit smoking, which can somehow explain the higher rate of health care utilization among former smokers. In this analysis, we have controlled for risk aversion. The proxy of risk aversion we use, indicates the individual's willingness to take financial risk. We are aware of the fact that a health risk might be perceived completely differently from a financial risk. Thus, this might not be the best variable controlling the risk preference but this was the only available option given the dataset.

Regarding other health behaviors, the results were either not statistically significant or showing a negative association between outpatient and inpatient care. Few countries are exceptional cases, for instance, in Greece for light drinkers or in France and Poland for those who are overweight. Valse et al. (2013), using data from Estonia, have found that light drinking, obesity, and overweight are associated with more use of health care services. The most common pattern among the elderly in the included countries is that alcohol consumption is associated with lower use of health care services. One explanation for excessive alcohol use is that not heavy drinking might have some health reason, meaning that those who drink heavily might be either less concerned about their health or healthier than those who do not drink (Vals et al., 2013). However, we control for three indicators of health status, namely the number of chronic diseases, the number of symptoms and self-perceived health status. It means that for two individuals with the same health status (regarding these indicators), the heavy drinker is less likely to use outpatient and inpatient care.

5.5.2 Health related behavior and out-of-pocket payments

The results do not show a systematic association between health behaviors and out-of-pocket payments. The most repeating pattern among countries is a positive association between light drinking and out-of-pocket payments for outpatient care, as well as a negative association between current smoking and out-of-pocket payments for prescribed drugs. With regard to the size of out-of-pocket payments, the common pattern which is repeated in most countries (8 of 12 countries

included in this study) is that alcohol consumption is associated with lower out-of-pocket payments for prescribed drugs. In contrast, whenever statistically significant (In Spain, Greece, and Belgium), the results show that ex-smoking is associated with a higher amount of out-of-pocket payments for prescribed drugs.

Less often out-of-pocket payments for prescribed drugs are explained by less use of outpatient care among current smokers in the respective country. However, it can also be observed in countries where the lower odds of outpatient care use for current smokers are not statically significant (i.e. the Netherlands, France). At the same time, although in Belgium current smokers are less likely to use outpatient care, the lower odds of out-of-pocket payments for prescribed drugs is not statistically significant. The higher odds of out-of-pocket payments for outpatient care in case of light dinking are quite challenging to be explained. They are observed in countries (Germany, the Netherlands, Italy, Switzerland, and Czech Republic) which are very different in terms of both health care financing and the prevalence of light drinking. In addition, these results are not due to more utilization of outpatient care among light drinkers, as we see less use of outpatient care by light drinkers. Nevertheless, it is possible that while light drinkers generally use less outpatient care, they need some special outpatient care that requires out-of-pocket payment more often than normal care. In addition, our data looked backward only three months for alcohol consumption. Thus, the reason of abstaining from alcohol might be the health problem. It means that abstainers in the last three month might have more severe health problems which lead them to quit drinking and can explain the higher out-of-pocket payments among them.

5.5.3 Relevance of the country context

For some health behaviors, the association between health behavior and out-of-pocket payments shown in the aggregated models is driven by a single country. For instance, the association between overweight and out-of-pocket payments in the aggregate model is only driven by Poland or the association between ex-smoking and the amount of out-of-pocket payment is only driven by Denmark. This suggests that the interpretation of our results on out-of-pocket payments should be based on the countries' contextual factors. For example, in Poland, the share of out-of-pocket expenditure on total pharmaceutical expenditure is the highest among OECD countries (OECD, 2011). Thus, the basic pharmaceutical package is very limited. In addition, 41% of the Polish individuals in our sample are overweight. As a result, the observed association between overweight and out-of-

pocket payments for prescribed drugs may just reflect higher out-of-pocket expenditures for pharmaceutical by elderly in general. In Denmark, there is no official charge for outpatient visits provided that a predetermined pathway is followed by patients. However, if individuals prefer more choice of health care providers, they have to pay out of pocket. Thus, the higher out-of-pocket payments for outpatient services by ex-smokers that we find for Denmark, might be due to preferences of elderly ex-smokers to choose their doctor on their own. We recognize however that this is only a hypothetical explanation, which needs to be tested.

5.6 Conclusion

Having compared 13 European countries in this chapter, we do not find systematic evidence that unhealthy behavior among elderly is associated with more utilization of health care and more out-of-pocket payments. The most consistent pattern among the elderly in the included countries appears in case of smoking. It shows that former smoking is associated with higher rate of health care use. In contrast, current smoking is associated with lower rate of health care use. These findings can have important policy implication regarding stick and carrot approach for individual responsibility for health. It shows that people at the time of engaging in an unhealthy behavior (i.e. current smoking, heavy drinking) are not using more health care than those who do not engage in respective behavior. Thus, using a stick like a copayment might not encourage them to quit. However, when people are in need of health care, resulting in more use of health care, they are most probably not engaging in unhealthy behavior (i.e. ex-smoking). Thus, using a stick like copayment would limit access to health care for those who need it which contradicts the principles of equity and solidarity.

Looking at the contextual factors in each country is crucial. Our findings per country can be of use for further studies on the causes of cross-country differences in out-of-pocket payments.

Chapter 6

General discussion

6.1 Introduction

The main aim of this dissertation has been to study how and to what extent health behavior is associated with health care cost coverage. In Chapter 1 we mentioned that the health insurance model suggests a tradeoff between health behavior and the level of health insurance coverage (i.e. ex-ante moral hazard). Due to ex-ante moral hazard, a full insurance coverage may provide incentives for individuals to become less concerned about their future health which consequently affects their lifestyle choices (Zweifel & Manning, 2000). One solution to ex-ante moral hazard is incomplete health insurance coverage, which is reflected in out-of-pocket payments (Kenkel, 2000). This solution to ex-ante moral hazard concerns another tradeoff between out-of-pocket payments and prevention (i.e. the use of preventive services). Out-of-pocket payments act as a financial barrier. Thus, they unintentionally decrease the use of preventive services (Jan Blustein, 1995; Busch, Barry, Vegso, Sindelar, & Cullen, 2006; Friedman et al., 2002; Geetesh Solanki, Helan H Schaffler, & Leonard S Miller, 2000a; Trivedi, Rakowski, & Ayanian, 2008; Wharam et al., 2008). The relationship between health insurance and health risk (health behavior) can also be in the opposite direction which is called adverse selection. Adverse selection refers to the fact that individuals with a higher (perceived) health risk tend to purchase more health insurance or a more extensive coverage (Powell & Goldman, 2013). Previous studies have given a core place to risk perception in health behavior theories (Brewer et al., 2007; Schwarzer, 2011). They show the indirect relationship between health insurance and health behavior. In other words, the relationship between health insurance and health behavior is mediated by risk perception. Thus, what actually matters is not health behavior itself but to what extent it would be perceived by individuals as a risk which can affect the future health. This fact can to some extent put a limitation on the research questions regarding the relationship between health insurance and health behavior.

In chapter 2, we have systematically reviewed the existing empirical evidence on the impact of out-of-pocket payments on prevention and health-related lifestyle. In chapter 3, we have examined the association between the type of health insurance and three common forms of unhealthy behaviors (i.e. daily smoking, excessive alcohol use, and physical inactivity) from the moral hazard perspective using data for the Netherlands. In chapter 4, we have looked at this association from the adverse selection perspective. In particular, we have examined the impact of daily smoking on the health care cost coverage in 12 European

countries in order to test for adverse selection. In Chapter 5, we have examined the association between out-of-pocket payments and health behavior. We have shown the out-of-pocket expenditures of those engaging in unhealthy behaviors (i.e. daily smoking, excessive alcohol use, obesity, and overweight) for outpatient, inpatient and prescribed drugs in 13 European countries.

For the analysis in this dissertation, the SHARE dataset has been used. The use of an existing dataset imposes some limitations. For instance, given the age specification of the SHARE dataset, our results refer to people aged 50 and over. Nevertheless, it still can be used to test our research objectives regarding the theory of ex-ante moral hazard and adverse selection. Also, we were limited by the questions asked in the questionnaire which did not provide all information we were looking for. It was the case especially in the choice of instrumental variables. This did not allow us to find more than one valid instrument.

In this chapter, we present and discuss the main findings of the dissertation in the form of five statements. The first two statements relate to the tradeoffs between health insurance coverage and prevention (the moral hazard perspective and the use of preventive services). The third statement focuses on adverse selection. The fourth statement discusses factors shaping individuals' health lifestyle. The fifth statement is a wrap-up of the whole dissertation.

6.2 Main findings

Statement 1: Out-of-pocket payments are a double edged sword for prevention. They reduce the demand for preventive services, and at the same time, they have the potential to encourage preventive activities such as a healthier lifestyle.

As explained in Chapter 1, prevention is an ex-ante activity to reduce the probability or vulnerability of diseases (Ehrlich & Becker, 1972). Thus, it encompasses lots of activities, ranging from lifestyle (e.g. smoking, alcohol consumption, unhealthy diet, overeating) to preventive services (e.g. vaccination, periodic examination, cancer screening). The results of our systematic literature review in Chapter 2 confirm the double effect of out-of-pocket payments on prevention. However, we have found that the effect of out-of-pocket payments on preventive services is a lot more studied than the effect of out-of-pocket payments on health lifestyle.

Most studies on the effect of out-of-pocket payments on preventive services come to the conclusion that out-of-pocket payments reduce the utilization

of preventive services (e.g. vaccination, screening), and adherence to medication (see Chapter 2). As mentioned in Chapter 1, when the price of health care services reduces due to health insurance coverage, insured individuals have an incentive to use more insured services. This can include more preventive services in the insurance package but also more health care services that are unnecessary and less valued from an economic point of view. Out-of-pocket payments are considered an efficiency improving tool since they are expected to decrease the use of these non-essential services. However, out-of-pocket payments are usually not targeting those low value and non-essential services, which is the reason to call out-of-pocket payments a blunt tool (Baicker & Goldman, 2011). It is argued that most people cannot distinguish between health care services or prescription drugs that are essential, and those that are not essential (Baicker & Goldman, 2011). In fact, the negative effects of out-of-pocket payments arise from this lack of knowledge. It is shown in the literature that the blind effect of out-of-payments on the services that are highly valued in secondary prevention, like adherence to medication, will lead to a lower utilization of these services, and thus, to the need of more expensive health care like hospitalization and nursing home (see Chapter 2). This eventually may cost the health care system more. Hence, providing some valuable services, such as preventive services, free of charge might imply to the patients that these services should be used.

As shown in Chapter 2, most evidence so far about the effect of out-of-pocket payments on the use of preventive services comes from the US. The reason for this is that patient cost-sharing in the US is widespread. However, the specificity of the US health care system questions the generalizability of the results of these studies to a different context particularly those in European countries, where health care financing is substantially different. In European countries, out-of-pocket payments are not as widely prevalent as in the US. However, there is a general tendency among policymakers in Europe toward making use of this tool more often than before (Tambor, Pavlova, Golinowska, Sowada, & Groot, 2013). Thus, it is a policy relevant question to ask to what extent the effects of out-of-pocket payments on prevention in a different setting (e.g. European setting) resemble their effects seen in the US. Further research could focus on the answer to this question.

Despite much more evidence on the negative effect of out-of-pocket payments on use of preventive services particularly in US, its positive effect on health behavior is not evident yet. As mentioned in Chapter 1, out-of-pocket payments, by discouraging ex-ante moral hazard, have the potential to encourage a healthier lifestyle. But, despite much theoretical discussion, the effect of out-of-

pocket payments on ex-ante moral hazard is not empirically established. Although the ex-ante moral hazard is more probable to exist in a publicly financed system (e.g. many European countries), we have found a few studies on the topic in Europe (see Chapter 2). However, the evidence is not conclusive. We also find a negative association between out-of-pocket payments and health behavior that is contradictory to the expectation based on ex-ante moral hazard (see Chapter 3). Thus, for the sake of policymaking, the effects of out-of-pocket payments on health behaviors continue to hang in the balance.

An important challenge for future studies on the effect of out-of-pocket payments on prevention and health behaviors is to identify causality (Zweifel et al., 2009). Many previous studies are cross-sectional and correlational studies (see Chapter 2). The challenges come from the fact that health insurance is not exogenous but self-selected. Thus, the health status of the individual is a determinant in choosing the type of health plan, which also determines the amount of out-of-pocket payments. As a result, a simple correlation cannot say much about the effect of out-of-pocket payments. Health care cost coverage provided in European countries is more exogenous than those provided in the US. This is because having at least a basic package is mandatory for every resident. However, this exogeneity cannot be used to test the effect of different level of coverage on prevention and health-related lifestyle, as the obligatory nature of health insurance plan officially means no or little variation in out-of-pocket payments. Nonetheless, variation in out-of-pocket payments can still exist due to supplementary health insurance which is not obligatory and then endogenous. Thus, the problem of endogeneity due to selection bias occurs again. Conducting a natural experiment to deal with this endogeneity problem (like what RAND did nearly 30 years ago) seems hardly feasible in Europe. Thus, future empirical studies could benefit from better use of existing data. For instance, Dave and Kaestner (2006) use exogenous variation in health insurance to test ex-ante moral hazard effect. Their study examines the behavior of uninsured Americans who turned 65 and thus become eligible for Medicare coverage. The use of instrumental variables to identify a causal effect is also encouraged. Finding a valid and relevant instrument, however, is not always possible and most of the time it is very challenging. For instance, Courbage and Coulon (2004) fail to find a valid instrument for smoking but they find one for exercise (see Chapter 2 and 4). More large secondary longitudinal datasets will help researchers to track and model unhealthy behaviors. For instance, SHARE dataset as a multidisciplinary panel micro dataset has gotten attention in recent years, particularly among researchers in Europe. As SHARE's longitudinal dimension

increases it would allow for further modeling of health behaviors which can also account for the potential causal impact of out-of-pocket payments.

Statement 2: Evidence suggests that extended health insurance coverage is associated with a healthier lifestyle which contradicts the notion of ex-ante moral hazard.

The theory of moral hazard suggests that more extensive health insurance coverage would undermine the choice of healthy behavior. However, this cannot be confirmed by our results. As discussed above, the results of our systematic review (see Chapter 2) show that the existing evidence is meager and contradictory. The results of our own case study for the Netherlands are also not supportive for the existence of ex-ante moral hazard, and even imply the contrary (see Chapter 3). For instance, should ex-ante moral hazard exist, we expect that a positive change in health insurance coverage (having a better coverage in 2007) leads to a negative change in health behavior (e.g. start smoking, excessive alcohol use or physical inactivity). However, our results in Chapter 3 show the opposite, as we find that better perceived health insurance coverage is associated with stopping alcohol use. We also find that those with better perceived health insurance coverage are less likely to continue daily smoking and excessive alcohol use, while those with worse perceived health insurance coverage are more likely to continue excessive alcohol use. Also, we find that having voluntary private insurance is positively associated with daily smoking and excessive alcohol use. At the time the data were collected, voluntary private insurance in the Netherlands often provided less generous coverage than compulsory social insurance for higher income people who are not eligible for latter (see Chapter 3). In view of this, these findings also seem to contradict the notion of ex-ante moral hazard. Although it can be argued that our conclusions depend on the Dutch context, the results of other studies done in different country contexts are in good agreement with our findings (see Chapter 3). It should be acknowledged however that some previous studies on the extent of ex-ante moral hazard offer support for the ex-ante moral hazard hypothesis (see Chapter 2).

Despite this contradiction in the findings of different studies, it is often noted that ex-ante moral hazard is unlikely to be a significant problem in the context of health insurance. It is because of the nature of health which is an 'irreplaceable commodity'. For instance, pain and suffering caused by illness cannot be directly expressed in monetary term and cannot be insured. As Kenkel (2000,

p.1687) points out “even if the consumer has generous coverage for the monetary components of the loss (medical expenditure and foregone earnings), he will be uninsured for the utility loss”. Thus, a health loss is never fully insured, which means that there are always incentives for the prevention of illness. In fact, no one prefers to get ill even if he does not bear the financial consequence of illness. It should be noted however that the relationship between unhealthy behavior and acquiring corresponding diseases is stochastic. Thus, not all smokers get, for instance, lung cancer. Also, the health effect of unhealthy behavior like smoking and obesity is not so immediate and may appear in the distant future. This provides room for the existence of ex-ante moral hazard.

A recent study by Dave and Keastner (2009) put forth an explanation why ex-ante moral hazard might not be seen as a significant problem in health insurance. They describe a direct and an indirect effect of health insurance on health behavior. They explain that health insurance, on the one hand, increases the contact with physicians and thus the patient will have easier access to their advice and consultation. On the other hand, health insurance may have a direct moral hazard effect on health behavior which reduces the incentives for prevention. Thus, the existence of these two offsetting effects makes a detection of a pure ex-ante moral hazard even harder. Dave and Kaestner (2009) show that if contacts with a medical professional are controlled for, obtaining health insurance reduces prevention and increases unhealthy behavior in the US. Consequently, they advise policymakers to remove copayments and annual deductibles applied to visits to the physician in order to encourage more contacts with medical professionals.

However, the explanation provided by Dave and Keastner (2009) seems hardly applicable to other settings than the US. For instance, in some European countries, no fee is applicable for visits to a general practitioner (Tambor, Pavlova, Woch, & Groot, 2011). In addition, the health care system is designed to provide access to primary care where a GP who patients are registered with, plays an important role not only as a first contact for the patient but also as a gate keeper for the health care system. For instance, in the Netherlands the basic package always includes visits to the GP and also the mandatory deductible does not hold for a visit to the GP. Nevertheless, the existing evidence about ex-ante moral hazard in Europe is limited and mixed, thus not convincing (see Chapter 2).

In sum, ex-ante moral hazard seems not to be a very strong driving force for individuals not to invest in prevention. Thus, policymakers should not be so worried that insurance coverage for preventive services and facilities which make preventive activities more feasible would lead to less prevention. Therefore,

subsidizing primary prevention and providing financial incentive to engaging individual in healthier lifestyle can be recommended.

Statement 3: Evidence suggests that people with a healthier lifestyle have more extensive health care cost coverage which contradicts the notion of adverse selection.

Adverse selection, in insurance, means that those who anticipate a higher risk are more willing to get insured or have more extensive coverage. However, this is not confirmed by our results (see Chapter 4). We find that, in general, the effect of smoking on health care cost coverage in Europe is negative (specifically for the group of elderly). Two exceptions are seen in Poland among women who live without a partner and in Switzerland among men who live without a partner. For these groups, our results show that being a daily smoker is associated with more health care cost coverage.

For adverse selection to occur, the possibility to choose the amount of health care coverage should be available. However, as pointed out in the introduction of this dissertation (see Chapter 1), the health care systems in European countries offer universal health care cost coverage for basic health care needs. Nevertheless, in all countries, even for countries where everyone is provided with automatic health care cost coverage, there is a possibility to extend this coverage at the individual's discretion (Paris et al., 2010). In our study, we create a variable to indicate self-assessed health care cost coverage by individuals on a scale of 4 to 16 (see Chapter 4). This variable can comprehensively encompass all three dimensions of health care cost coverage (namely breadth, scope, and depth). Thus, it is more informative about the extent of health insurance coverage than variables used in the other studies like the probability of purchasing private insurance (Doiron et al., 2008; Olivella & Vera-Hernandez, 2008) or the amount of health insurance coverage (Lambert et al., 2011). In addition, that variable can better address the long standing interest in the extent of adverse selection that might exist in different health care setting, particularly those with public financing.

The occurrence of adverse selection also depends on the health risk. In order to study adverse selection, previous studies have used different indicators for health risks. A larger number of studies use health care expenditure (Cardon & Hendel, 2001; Gardiol, Geoffard, & Grandchamp, 2005; Powell & Goldman, 2013) or health care use (Ettner, 1997; Olivella & Vera-Hernandez, 2008) to proxy health risk. Lambert et al. (2011) use the number of long term spells of ill health in the

past to indicate health risk. However, they offer mixed support for the existence of adverse selection. Some of these studies cast doubt on the presence of adverse selection (Cardon & Hendel, 2001; Lambert et al., 2011), while others report evidence that it exists (Ettner, 1997; Gardiol et al., 2005; Olivella & Vera-Hernandez, 2008; Powell & Goldman, 2013).

A small number of studies, like ours, consider health behavior as an indicator for health risk. Similar to our study, they use smoking as a proxy for health risk as the causative role of smoking for some diseases is well established. All of those studies have been conducted in Australia (Barrett & Conlon, 2003; Doiron et al., 2008; Hopkins & Kidd, 1996). Consistent with our results, they show a negative association between smoking and the likelihood of buying private health insurance in Australia. These results however contradict with the notion of adverse selection. However, those studies have mostly used a correlational design which cannot address the classical problem of distinguishing between moral hazard and adverse selection. Also they argue that the decision not to buy private health insurance and to engage in smoking might be jointly affected by risk aversion.

We find that smoking is related to a decreased self-assessed health insurance coverage among men and women who live without a partner (see Chapter 4). Consistent with previous studies, it can be explained by heterogeneity in risk aversion. In other words, risk aversion is unobservable which drives the negative effect of smoking on health insurance coverage. In this sense, the more risk-averse individuals are, the healthier the lifestyle they have, and at the same time more extensive health insurance coverage they will choose. It is evident that individuals' attitude toward risk is related to their personal characteristics (e.g. age, gender, marital status, income, employment status). For instance, there is evidence which suggests that those who are single are less risk averse than those who are married (Hartog, Ferrer-i-Carbonell, & Jonker, 2002). The negative effect of smoking in our study appears statistically significant only among those who live without a partner. Thus, this again may imply that risk aversion rather than adverse selection play a role in shaping the relationship between smoking behavior and the level of health care cost coverage.

Therefore, when using health behavior (e.g. smoking) as proxy for health risk, there is more consistent evidence against the existence of adverse selection (see Chapter 4). This can be explained by the fact that under the adverse selection, individuals are foresighted enough to estimate the future health consequence of their current unhealthy behavior and take precautionary action (i.e. extending their insurance coverage). It is argued that smokers exercise myopic behavior (Becker et

al., 1994). Thus, they might not be fully aware of the future health consequence of their current behavior. As a result, adverse selection does not seem to be a strong driving force for those who engage in unhealthy behavior to opt for more extensive coverage, but mostly for risk-averse individuals.

Statement 4: A uniform prescription to effectively and efficiently encourage healthy behavior does not exist. Contingent on the context, each behavior deserves a separate treatment.

As pointed out in Chapter 1, health behavior can be broadly defined as any action or inaction which affects individuals' health. A range of behaviors fit this definition. A large body of literature has studied the determinants of different types of health behavior. These studies have mostly focused on socioeconomic factors that affect those types of behavior (Harper & Lynch, 2007; Laaksonen et al., 2003; Shankar et al., 2010). Some studies have also investigated the effect of health status of individuals (mostly self-assessed health status) on health-related behavior (P. B. Johnson & Richter, 2002; Newsom et al., 2012). However, each study uses its own set of explanatory variables for a single health behavior, which makes a comparison between different types of behavior difficult.

In this dissertation, we have restricted ourselves to the three most common forms of unhealthy behavior (i.e. smoking, excessive alcohol use and physical inactivity). We use a comprehensive set of explanatory variables to study the three behaviors together to see whether the effect of each variable is consistent among different behaviors. In addition, the same set of covariates is used for studying the dynamics of each behavior (i.e. positive or negative change in behavior in the subsequent year of the study). We also include the type of health insurance and perceived change in health insurance coverage. Our results show that even these three types of health behavior cannot be considered as a uniform concept. Each behavior deserves separate attention since the determinants of each behavior are different. In particular, our results show that each behavior has its own set of covariates. Even when there are some determinants in common, their effects might be in a different direction. For instance, we find that women are less likely to smoke daily and to excessively use alcohol but at the same time are more likely to be physically inactive. Thus, although being a female has an effect on all three health behaviors in our study, we cannot conclude that being female results in a healthier lifestyle. The same applies for the dynamics of health behaviors. For instance,

women are more likely to stop heavy drinking but, at the same time, more likely to become physically inactive (see Chapter 3).

Even when considering each behavior separately, the results might be sensitive to how far we would go in including more detailed information on individual's characteristics in the models. For instance, comparative analyses across Europe have shown an inverse social gradient of smoking. In general, they show that as the levels of education and income increase, the prevalence of smoking decreases. However, in our comparative analyses among 12 European countries when we use stratified models based on gender and marital status, we find an inverse gradient only among one of the groups (see Chapter 4). Specifically, our results show that the negative effect of education and income on smoking only holds among men who live with a partner and the effect for the other group is not statistically significant. This shows that even within gender groups the impact of socioeconomic variables may differ depending on household composition. The above findings are more supportive of individualized health improvement programs in order to shape individual's health habit. It suggests that personal characteristics as well as environmental characteristics should be included in the analysis. Such environmental characteristics, indeed, should comprise household characteristics as well as the country context where an individual lives. The latter is supported by our results, which indicate significant differences across countries.

Since the determinants of health behavior seem to differ between countries and also between individuals in one country, interventions that aim to encourage healthy behavior should be accordingly adjusted depending on the country and individual situation. A uniform policy to promote healthy behavior, even at a national level, seems neither efficient nor effective. An overall insight in determinants of health behaviors can be extremely useful as a framework for possible interventions. However, this framework should be adjusted considering the health behavior which is addressed, the individuals who are engaged in that specific behavior and the context where the behavior occurs.

Beside the uniqueness of each health behavior, they are not independent of each other. Bivariate and multivariate associations between for instance smoking, alcohol consumption and physical activity are reported in previous studies (Prochaska, Spring, & Nigg, 2008). Thus, an individualized health improvement program should also account for the interaction between different types of unhealthy behavior.

Statement 5: In a carrot and stick approach to promote health behavior, the potential of out-of-pocket payments as a stick is doubtful, given its effects on solidarity and freedom of choice.

The high burden of chronic diseases that is preventable through lifestyle change increases the tendency to shift more responsibility on individuals for their own health (Stegeman et al., 2013). In doing so, a carrot and stick approach can be used to reward desired behavior and to punish undesired ones; carrots like discounts in premiums, or vouchers for a fitness club or to buy sport equipment, and sticks like copayments or a higher place on a waiting list for people with an unhealthy lifestyle (Blacksher, 2008). Our results challenge the effectiveness of out-of-pocket payments (i.e. copayments, deductibles) as a stick to promote health behavior, premised on the theory of ex-ante moral hazard (see Chapter 3). In particular, our results shed more light on the ongoing debate which argues for a sort of lifestyle stratification in health care financing, particularly in solidarity-based health care systems like those of most European countries (see Chapter 5).

Regardless of how effective out-of-pocket payments are to encourage healthy behavior or discourage an unhealthy one, they can be viewed as the price one should pay for the choice he has freely made. Freedom of choice is a widely accepted social value in many countries. However, autonomy comes with responsibility. Thus, although individuals should feel free to live their lives as they wish, they also should be fully ready to shoulder the respective costs. In this sense, there is no room for government intervention as far as an individual's choice is not imposing extra costs on others (Loewenstein, Asch, Friedman, Melichar, & Volpp, 2012). However, this might be the case wherever solidarity is also a widely accepted social value. Solidarity asks for an equal financial contribution by all residents irrespective of their actual health care use. Two well-known types of solidarity are income solidarity that exists between rich and poor, and risk solidarity that exists between sick and healthy, or old and young (Trappenburg, 2000). There is also a hidden type of solidarity, which exists between those who have a healthy lifestyle and those who do not. This so called lifestyle solidarity is currently subject to much debate and criticism (Bonnie, van den Akker, van Steenkiste, & Vos, 2010; Stegeman et al., 2013; Trappenburg, 2000).

It is argued that in a publicly financed system, the costs of an unhealthy lifestyle are borne not only by those who make that unhealthy choice but also by those who choose to live healthy. Thus, in this case, freedom of choice inflicts extra cost upon others and thus could be subject to intervention. For instance, whether

or not to smoke is an individual's decision. However, due to solidarity, the cost of the adverse health effects of smoking are paid out of a collective pocket, thus, both by smokers and non-smokers. It means that the extra health care use of the health care system by smokers is subsidized by non-smokers. As a result, it gives rise to growing support for imposing limits on lifestyle solidarity; for instance by charging out-of-pocket payments for health care that is used as a result of unhealthy behavior, or setting a higher insurance premium for those who engaged in unhealthy behavior (Stegeman et al., 2013).

At the same time, while it is not fair to let other people pay for the cost arising from an unhealthy lifestyle; it might not seem fair either to punish people because of their lifestyle (Wikler, 2002). This is because health lifestyle is not an isolated individual choice but rather it is “contextually embedded behavioral patterns, forged over time under the influence of class circumstance, race, ethnicity, living condition, and norms related to work, religion, family, and more” (Blacksher, 2008, p. 3). Thus, even when individuals are fully free to make choices, they are limited to choose between available options which are determined out of their control. Social determinants of health behavior have been extensively discussed in the literature, and we have also shown that their effects are not even consistent across different health behaviors (see Chapter 3). Nonetheless, the risks linked to unhealthy behavior are voluntarily assumed, and they are accepted as the price of their choices which have been eventually made at individual's discretion. Thus, there is always some autonomy that justifies proportionate responsibility. Our findings are of relevance to this hot debate. Since, on the one hand, they show to what extent unhealthy behaviors are associated with health care use. On the other hand, they show to what extent unhealthy behaviors are associated with out-of-pocket payments for that health care use (Chapter 5).

Contrary to our expectation, we find no systematic evidence of more use of health care by those engaged in unhealthy behavior (i.e. smoking, excessive alcohol use and obesity or overweight, specifically among elderly), and even further, we find that for instance current smokers are less likely to use health care (see Chapter 5). However, given the cross-sectional nature of our data, these findings can only show the association between a current engagement in unhealthy behavior and the use of health care in the immediate past (last twelve months). It is clear that the adverse health consequence of unhealthy behaviors might appear some years later, which can be a *de facto* reason for abstaining from that behavior. This is also evident from our results which show a positive association between ex-smoking and health care use (see Chapter 5). Thus, our results show that an immediate

relationship between unhealthy behavior and use of health care might not exist. However, this would happen some day later even when the person is not engaging in unhealthy behavior. These findings have a clear implication for the desirability of out-of-pocket payments (i.e. copayments, deductible) as limits to lifestyle solidarity.

Charging more out-of-pocket payments for health care use of those who currently engage in unhealthy behavior (e.g. current smokers) might not be justified by lifestyle solidarity as they are not likely to use health care more than others (e.g. never smokers). Also we have already seen that out-of-pocket payments might not be an effective tool to discourage smoking behavior (see Chapter 3). Even conversely, more out-of-pocket payments might decrease the chance of behavior change that could result from more contact with a health care professional. However, when out-of-pocket payments might be justifiable for policies to diminish lifestyle solidarity for instance in case of ex-smoking, it raises lots of ethical concern because it could deprive individuals from their basic needs.

An alternative to out-of-pocket payments is to set a higher insurance premium for those who engage in unhealthy behavior. This higher premium can spare more funds for the future when the adverse health effects of unhealthy behavior appear, and thus may result in more health care use. In addition, a higher premium can be set for having an unhealthy behavior irrespective of actual health care use. Thus, they can be seen not only as a stick but as a limit to lifestyle solidarity without compromising the provision of basic needs. However, applying a risk-rated premium, in countries surrounded by a culture of solidarity is not always feasible, and either, seems to be far from implementation.

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Appendix A

**Wording of selected questions used in this
dissertation from the SHARE questionnaire**

Appendix A

The full version of questionnaires for all waves can be found at <http://www.share-project.org/data-access-documentation/questionnaires>.

BR001_ EVER SMOKED DAILY

The following questions are about smoking and drinking alcoholic beverages. Have you ever smoked cigarettes, cigars, cigarillos or a pipe daily for a period of at least one year?

1. Yes 5. No

IF BR001_ (EVER SMOKED DAILY) = 1. Yes

BR002_ SMOKE AT THE PRESENT TIME

Do you smoke at the present time?

1. Yes 5. No, I have stopped

BR010_ BEVERAGES CONSUMED LAST 6 MONTHS

I am now going to ask you a few questions about what you drink - that is if you drink. Please look at card 11. During the last six months, how often have you drunk any alcoholic beverages, like beer, cider, wine, spirits or cocktails?

1. Almost every day 2. Five or six days a week 3. Three or four days a week 4. Once or twice a week
5. Once or twice a month 6. Less than once a month 7. Not at all in the last 6 months

IF BR010_ (BEVERAGES CONSUMED LAST 6 MONTHS) < 7. Not at all in the last 6 months

BR011_ FREQ MORE THAN 2 GLASSES BEER IN A DAY

Please look at card 11. During the last six months, how often have you had more than two glasses or cans of beer or cider in a single day?

1. Almost every day 2. Five or six days a week 3. Three or four days a week 4. Once or twice a week
5. Once or twice a month 6. Less than once a month 7. Not at all in the last 6 months

BR012_ FREQ MORE THAN 2 GLASSES WINE IN A DAY

(Please look at card 11.) During the last six months, how often have you had more than two glasses of wine in a single day?

1. Almost every day 2. Five or six days a week 3. Three or four days a week 4. Once or twice a week
5. Once or twice a month 6. Less than once a month 7. Not at all in the last 6 months

BR013_ FREQ MORE THAN 2 HARD LIQUOR IN A DAY

(Please look at card 11.) During the last six months, how often have you had more than two cocktails or drinks of hard liquor in a single day?

1. Almost every day 2. Five or six days a week 3. Three or four days a week 4. Once or twice a week
5. Once or twice a month 6. Less than once a month 7. Not at all in the last 6 months

BR015_ SPORTS OR ACTIVITIES THAT ARE VIGOROUS

We would like to know about the type and amount of physical activity you do in your daily life. How often do you engage in vigorous physical activity, such as sports, heavy housework, or a job that involves physical labor?

1. More than once a week 2. Once a week 3. One to three times a month 4. Hardly ever, or never

BR016_ ACTIVITIES REQUIRING A MODERATE LEVEL OF ENERGY

How often do you engage in activities that require a low or moderate level of energy such as gardening, cleaning the car, or doing a walk?

1. More than once a week 2. Once a week 3. One to three times a month 4. Hardly ever, or never

HC054_ BASIC HEALTH INSURANCE DEDUCTIBLE

What is the deduction for your basic health insurance?

HC057_ BASIC HEALTH INSURANCE COVERAGE

Are you covered by the National Health Insurance System?

1. Yes 5. No

HC059_ CONTRACT VOLUNTARY HEALTH INSURANCE

Please look at card 19. Do you have any voluntary health insurance contract for at least one of the following types of care? If yes, please say what is covered.

Appendix A

1. Medical care with direct access to specialists
2. Medical care with access to specialists through a general practitioner
3. Medical care with unrestricted choice of doctors
4. Medical care with limited choice of doctors
5. Dental care
6. Full coverage of drugs expenses
7. Partial coverage of drugs expenses
8. Hospital care with unrestricted choice of hospitals and clinics
9. Hospital care with limited choice of hospitals and clinics
10. Long term care in nursing home
11. Nursing care at home in case of chronic disease or disability
12. Home help
96. No voluntary health insurance at all
97. Any other type of voluntary health insurance

HC060_ CONTRACT VOLUNTARY, SUPPLEMENTARY HEALTH INSURANCE

Please look at card 20. Do you have any voluntary, supplementary or private health insurance for at least one of the following types of care in order to complement the coverage offered by the National Health System? If yes, please say what is covered.

1. Medical care with direct access to specialists
2. Medical care with an extended choice of doctors
3. Dental care
4. A larger choice of drugs and/or full drugs expenses (no participation)
5. An extended choice of hospitals and clinics for hospital care
6. (Extended) Long term care in a nursing home
7. (Extended) Nursing care at home in case of chronic disease or disability
8. (Extended) Home help for activities of daily living (household, etc.)
9. Full coverage of costs for doctor visits (no participation)
10. Full coverage of costs for hospital care (no participation)
96. No voluntary health insurance at all
97. Any other type of voluntary health insurance

Wave 2:

HC069_ CHANGES HEALTH INSURANCE COVERAGE

We are interested in how your health insurance may have changed since our last interview in [{month year previous interview}]. Taking all your social and health insurances into account, has anything changed, for better or for worse, in your coverage for health problems since [{month year previous interview}]?

1. No change
2. Better coverage now
3. Worse coverage now

HC067_ INTRO HEALTH INSURANCE COVERAGE

Please look at card 19. I am now going to read out some types of health care. Thinking about your current health insurance, please tell me who [In countries with deductibles in health insurance: PAST YOUR DEDUCTIBLE] finally pays for the costs of these type of care, should you need them: | yourself only, mostly yourself, mostly social insurances and your health insurances, or social insurances and your health insurances only?

HC068_ CURRENT HEALTH INSURANCE COVERAGE

Who finally pays for [medical visits to a general practitioner/medical visits to specialists, when prescribed by a general practitioner/medical visits to specialists, when not prescribed by a general practitioner/medical visits to any doctor of your choice/dental care/prescribed drugs/hospitalizations in public hospitals/hospitalizations in private hospitals/stays in a nursing home/nursing care at home in case of chronic disease or disability]?

IF RESPONDENT PAYS FIRST BUT LATER GETS REIMBURSED BY HEALTH INSURANCES, THIS IS NOT 'ENTIRELY BY RESPONDENT.

1. Entirely paid by respondent
2. Mostly paid by respondent
3. Mostly paid, or reimbursed, by social insurances and/or respondent's health insurances
4. Entirely paid, or reimbursed, by social insurances and/or respondent's health insurances

HC045_ PAID OUT-OF-POCKET FOR INPATIENT CARE

Not counting health insurance premiums or reimbursements from employers, about how much did you pay out-of-pocket for all your hospital inpatient care in the last twelve months?

IF NECESSARY READ: BY OUT OF POCKET EXPENSES WE MEAN EVERYTHING THAT IS NOT PAID BY THE INSURANCE COMPANY. IF YOU FIRST PAY BUT LATER GET IT REIMBURSED, THIS IS NOT OUT OF POCKET EXPENSES. IF THE INSURANCE COMPANY PAYS FIRST, BUT LATER CHARGES YOU, THIS IS OUT OF POCKET EXPENSES.

HC047_ PAID OUT-OF-POCKET FOR OUTPATIENT CARE

Appendix A

Not counting health insurance premiums or reimbursements from employers, about how much did you pay out-of-pocket for all your outpatient care, in the last twelve months?

EXPLAIN: CONSIDER EXPENSES FOR CONSULTATIONS FOR ALL HEALTH PROFESSIONALS, INCLUDING DENTISTS, FOR ALL LABS, EXAMS, OR THERAPIES PRESCRIBED BY DOCTORS, AND FOR OUTPATIENT SURGERY - DO NOT CONSIDER EXPENSES FOR DRUGS OR FOR ALTERNATIVE MEDICINES.

HC049_ PAID-OUT-OF-POCKET FOR PRESCRIBED DRUGS

Not counting health insurance premiums or reimbursements from employers, about how much did you pay out-of-pocket for all your prescribed drugs, in the last twelve months?

DO NOT CONSIDER EXPENSES FOR SELF-MEDICATION OR DRUGS NOT PRESCRIBED

Appendix B

List of reviewed publications in Chapter 2

Appendix B

- Ashraf, N., J. Berry, and J.M. Shapiro, *Can higher prices stimulate product use? Evidence from a field experiment in Zambia*. 2007, National Bureau of Economic Research Cambridge, Mass., USA.
- Bisson, G.P., et al., *Out-of-pocket costs of HAART limit HIV treatment responses in Botswana's private sector*. AIDS, 2006. 20(9): p. 1333-35
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- Boyle, R.G., et al., *Does insurance coverage for drug therapy affect smoking cessation?* Health Affairs, 2002. 21(6): p. 162-168
- Braitstein, P., et al., *Mortality of HIV-1-infected patients in the first year of antiretroviral therapy: comparison between low-income and high-income countries*. Lancet, 2006. 367(9513): p. 817-824
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- Cherkin, D., L. Grothaus, and E. Wagner, *The effect of office visit co-payments on preventive care services in an HMO*. Inquiry: a journal of medical care organization, provision and financing, 1990. 27(1): p. 24-38
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- Choudhry, N.K., et al., *Should patients receive secondary prevention medications for free after a myocardial infarction? An economic analysis*. Health Aff (Millwood), 2007. 26(1): p. 186-94.
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- Dupas, P., *The Impact of Conditional In-Kind Subsidies on Preventive Health Behaviors: Evidence from Western Kenya*. Unpublished manuscript, 2005.
- Ellis, J.J., et al., *Suboptimal statin adherence and discontinuation in primary and secondary prevention populations*. J Gen Intern Med, 2004. 19(6): p. 638-45.
- Faulkner, L.A. and H.H. Schauffler, *The effect of health insurance coverage on the appropriate use of recommended clinical preventive services*. American Journal of Preventive Medicine, 1997. 13(6): p. 453-458
- Federman, A.D., et al., *Supplemental insurance and use of effective cardiovascular drugs among elderly Medicare beneficiaries with coronary heart disease*. JAMA: the journal of the American

Medical Association, 2001. 286(14): p. 1732-1739.

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Gibson, T.B., et al., *Impact of statin co-payments on adherence and medical care utilization and expenditures*. Am J Manag Care, 2006. 12:sp11-sp19

Gibson, T.B., et al., *The effects of prescription drug co-payments on statin adherence*. American Journal of Managed Care, 2006. 12(9): p. 509-517

Goldman, D.P., et al., *Pharmacy benefits and the use of drugs by the chronically ill*. JAMA: the journal of the American Medical Association, 2004. 291(19): p. 2344-2350

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Piette, J.D., et al., *Health insurance status, cost-related medication underuse, and outcomes among diabetes patients in three systems of care*. Medical care, 2004. 42(2): p. 102-109

Appendix B

Pilote, L., et al., *The effects of cost-sharing on essential drug prescriptions, utilization of medical care and outcomes after acute myocardial infarction in elderly patients*. Canadian Medical Association Journal, 2002. 167(3): p. 246-252

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Schneider, U. and J. Zerth, *Improving Prevention Compliance through Appropriate Incentives: Theoretical Modelling and Empirical Evidence*. Swiss Journal of Economics and Statistics (SJES), 2011. 147(I): p. 71-106.

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Appendix C

**Summary of key results per publication
reviewed in Chapter 2**

Table C.1 *Primary prevention and Healthy behavior*

Reference/country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Health promotion activities						
Schneider, et al. 2011 Germany Peer-reviewed journal article	Using data from German socio-economic panel survey(SOEP) 1995-2002 Nationally representative data of private household Applying Discrete-time proportional hazard model to question of quitting smoking Demographic, socioeconomic, health insurance and health status covariates are included.	Non-smoker at the beginning of the year	No insurance	Positive effect HR 5.1771	Reliability: Clear Internal validity: clear External validity: clear only in national level	Health capital stock and information play a central role on the decision about prevention. An effect with respect to insurance coverage only exists for those individuals without health insurance. These individuals show a better behavior than those with SHI coverage.
Courbage, et.al. 2004 UK Peer-reviewed journal article	using data from British household panel survey 2000/2001 nationally representative data using Probit regression(Socioeconomic and health Covariates are included in the model) and IV estimates for omitted variable bias of "risk aversion".	Walking ,swimming and practicing a sport smoking	Having private insurance	Significant positive effect on walking and swimming and practicing a sport Significant negative effect on smoking (Both significant at 1 percent level)	Reliability: clear Internal validity: clear External validity: clear only in national level	Health market with health insurance leads more to prevention then health market without health insurance.

Reference/country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Krist, et al. 2010 USA Peer-reviewed journal article	Mixed-methods case study Quantitative: one group post test design qualitative: semi structured interview (purposive sampling)	Referral rate for intensive counseling for patients with unhealthy behavior	\$60 for telephone or e-counseling \$110 for smoking group classes \$10 per week for weight watchers	Referral decreased by 97% (from 21.8% to 0.7%, $p < 0.001$) Clinicians asked fewer patients about health behavior (37% vs 29%, $p < 0.001$) Clinicians offered less patients referral (29% vs 6%, $p < 0.001$) Patients less interested in accepting referral (76% vs 14%, $p < 0.001$)	Reliability: Clear Internal validity: clear Quantitative design is improved by qualitative design External validity: unclear	Coverage for intensive health behavior counseling is important to utilization. The potential public health benefits of such a program to reduce unhealthy behaviors justify the elimination of financial barriers (e.g., copayments) by payers.
Fronstin, et al. 2009 USA Issue brief	Using data from 2009 EBRI/MGA consumer engagement in health care survey Cross-sectional online survey Sample stratified by gender, age, income, race	Probability to participate in health promotion program, probability of being smoker, being obese and doing exercise	Consumer-driven health plan (CDHPs) Vs. Traditional plan	CDHPs enrollees are more likely to participate in health promotion program Less likely to smoke More likely to exercise Less likely to be obese	Reliability: Clear Internal validity: Unclear External validity: Unclear	It is not clear that the difference in consumer engagement can be attributed to plan design difference or whether various plan designs attract a certain kind of individual.

Reference/country of origin of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Boyle, et al. 2002 USA Peer-reviewed journal article	Quasi experiment Response rate to baseline survey : 86.5 and 86.4 for member with the benefit and without the benefit respectively	Attempt to quit smoking or actual quitting	Smoking-cessation benefit (insurance coverage for pharmacotherapy)	Not significant	Reliability: Clear Internal validity: clear External validity: Unclear	The study doesn't support the idea that providing coverage for smoking cessation pharmacotherapy will have a substantial effect on rates of smoking cessation but further studies are needed to test whether greater efforts to make smokers aware of insurance benefits or adding other types of cessation support might lead to any beneficial effects
Family program						
Harvey, et al. 1994 23 developing countries Peer-reviewed journal article	Analyzing price and sales data for 24 social marketing program among 23 developing countries in 1991	Per capita sales of condoms	Consumer price for condoms expressed as percentage of per capita gross national product	Correlation is strong and negative	Reliability: clear Internal validity: clear External validity: clear	The condom price must be set very low in order to achieve satisfactory prevalence for condoms in family planning and AIDS prevention context (Ideal price 0.5 % or less with maximum of 1%)
Dupas, et al. 2005 Kenya Unpublished manuscript	quasi experiment Treatment and control group Using difference-in-difference estimator with facility-level panel data	Enrollment at prenatal clinic HIV testing The number of follow up visit at the prenatal clinic	Conditional in-kind subsidies (providing free ITNs)	117% increase in enrollment 84 % increase in HIV testing 59% increase in the number of follow up visit at prenatal clinic	Reliability: clear Internal validity: clear External validity: unclear	In areas of intense malaria transmission and high HIV prevalence, providing free treated nets to pregnant women through prenatal clinics could save the lives of 18 babies per 1,000 pregnancies at a cost of US \$441 per child life saved.

Reference/country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Immunization						
Cherkin, et al. 1990 USA Peer-reviewed journal article	Quasi experiment Treatment and comparable control group	Childhood immunization	Office visit copayment of \$5	Not significant	Reliability: clear Internal validity: clear External validity: unclear	Small copayment for office visit have little adverse impact of utilization of the most valuable types of preventive care services
Lurie, et al. 1987 USA Peer-reviewed journal article	experiment Using data from health insurance experiment	Immunization	Cost sharing plan Vs. Free plan	Decrease percentage of children 0-6 age received any kind of immunization from 60% to 49 %	Reliability: clear Internal validity: clear External validity: clear only in national level	Free care alone, while significant, is not a sufficient incentive to providing recommended levels of preventive care.
Providing ITNs						
Cohen, et al. 2008 Kenya Working paper	Experiment 20 rural public health center randomly assigned to five groups: 4 as control group, 5 giving free of charge ITNs, 5 giving ITNs for 10 Ksh, 3 for 20 Ksh, 3 for 40 Ksh	Demand of ITNs Usage of ITNs	Price of ITNs	Highly price-elastic Decrease by 75% when the price increase from zero to \$0.75 Price -inelastic	Reliability: clear Internal validity: clear External validity: unclear	Free distribution of ITNs could save many more lives than cost sharing programs have achieved so far, and, given the large positive externality associated with widespread usage of ITNs, it would likely do so at a lesser cost per life saved.

Reference/country data/ type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Okarah, et al. 2002 Burkino faso Peer-reviewed journal article	Qualitative : focus group discussion, individual and key informants interview toward Malaria related knowledge attitude and practice (KAP) Quantitative: survey including question about willingness to pay	Purchasing ITNs	Price	Willingness to pay among majority not more than 0.5-1US \$ on treatment, 37% of respondents wanted them for free, 45% for reduced prices and 10% on credit	Reliability: clear Internal validity :clear External validity: unclear	People are willing to treat existing nets and to buy ITNs, but only if such services would be offered at reduced prices and in closer proximity to the households.
Guyatt, et al. 2002 Kenya Peer-reviewed journal article	Survey Willingness to pay assessment Four household wealth variables included	Purchasing ITNs	Price	97% were willingness to pay for an ITNs. The most frequent amount offered was Ksh 50(US\$0.64), but it's not sufficient to cover all cost. People can't afford the cost (the cost of purchasing ITNs for a household is the cost of sending three children to school.	Reliability: clear Internal validity: clear External validity: unclear	One option to have an immediate equitable impact on ITN coverage and break the cycle between malaria and poverty is to provide this service free of charge.

Reference/country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Water purification						
Ashraf, et al. 2007 Zambia Working paper	Consisted of a baseline survey, a randomized door- to-door marketing intervention and a follow up survey	Usage of water purification solution (chlorine)	Price	An increase of 100 Kw in the offer price would result in about 7 % point reduction in the probability of purchase .(price elasticity of about - 0.6 An increase of 100 Kw in the offer price leads to a 3.7 % point increase in reported Chlorine use among buyers.(usage elasticity of about 0.36)	Reliability: clear Internal validity: clear External validity: un clear	Higher prices screen out less intensive users of the product. High prices do not cause greater product use than low prices for a given buyer, but there is some evidence that the act of paying increases use.

*clear: reliability, internal and external validity are discussed in the study or it is easy to be understood from information the study provides.

**unclear: reliability, internal and external validity are not discussed in the study or it is not easy to be understood from information the study provides or the study itself expresses doubt about them.

Table C2 *Secondary prevention*

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Medication adherence						
Ellis, et al. 2004 USA Peer-reviewed journal article	Longitudinal ,retrospective ,cohort study using pharmacy and administrative data bases from 1999 to 2003 Logistic regression A proxy for social support (gender, race and marital status) is included.	Medication adherence	Copayment ≥\$20 Vs. Copayment <\$10	Significant Odds ratio 3.23; 95% CI 2.55 to 4.10	Reliability: clear Internal validity: clear External validity: unclear The study mentions that the generalizability of findings may be limited.	Incremental efforts, including those that decrease out-of-pocket pharmaceutical expenditures, should focus on improving adherence in high-risk populations most likely to benefit from statin use
Ye, et al. 2007 USA Peer-reviewed journal article	Longitudinal retrospective cohort study using MedStat MarketScan 1999- 2003 databases Multivariate logistic regression Demographics and clinical characteristics are included as covariates based on “Anderson health service utilization model”	Medication adherence	Copayment ≥\$20 Vs. Copayment <\$10	Significantly less likely to be adherent Odd ratio 0.42;95%CI,0.36-0.49	Reliability: clear Internal validity: clear External validity: unclear	High prescription copayment seems to be a significant barrier to statin adherence.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Ye, et al. 2007 USA Peer-reviewed journal article	Longitudinal retrospective cohort study using MedStat MarketScan1999- 2003 databases Multivariate logistic regression Demographics and clinical characteristics are included and covariates based on "Anderson health service utilization model	Statin prescription after CHD hospitalization	Copayment $\geq \$20$ Vs. Copayment $< \$10$	Significantly less likely to receive an outpatient statin Odd ratio .062;95%CI 0.056-0.68	Reliability: clear Internal validity: clear External validity: unclear	Higher copayment amount is associated with lower likelihood of taking a statin prescription after a CHD hospitalization.
Gibson, et al. 2006 USA Peer-reviewed journal article	Longitudinal retrospective cohort study using MedStat MarketScan2000- 2003 databases Logistic regression model Sociodemographic characteristics are included in the model	Statin adherence	Copayment and coinsurance	A \$10 increase in statin cost sharing was associated with an 8.9% decrease ($p < .01$) in the odds of being adherent for new users and 11.9% decrease ($p < .01$) for continuing users	Reliability: clear Internal validity: Clear (some concerns about it are clearly addressed) External validity: unclear	Policymakers should consider lower copayment as an intervention that improve adherence to statin
Gibson, et al. 2006 USA Peer-reviewed journal article	Cross-sectional time series design, using data from 2000-2003 Medstat MarkerScan data base Generalized estimating equation models Sociodemographic health plan, medication variables are included	Statin adherence	Copayment	100% copayment increase declined monthly adherence 2.6 and 1.1 % among new users and continuing users respectively ($p < .01$) New statin users were more price sensitive than continuing users	Reliability: clear Internal validity: clear External validity: unclear	High copayments are a financial barrier to statin adherence. Given the relationship between statin use and decreased frequency of cardiovascular events and procedures, the implications of high

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal External validity (clear*, unclear**)	Conclusion and policy recommendation
Goldman, et al. 2004 USA Peer-reviewed journal article	Longitudinal retrospective cohort study using pharmacy claims data with health benefit designs A two part model using probit and generalized linear model	Overall days supplied	Doubling copayments	23 % reduction in annual days supplied of anti- diabetic drug for diabetic patient(more than three months ; from 390 to 293) 10 % reduction in annual days supplied of anti- hypertensive drug for hypertension (more than one month from 386 to 347.5)	Reliability :clear Internal validity: clear External validity: unclear	Significant increases in copayments raise concern about adverse health consequences because of the large price effects, especially among diabetic patients. copayments should be considered by policymakers.
Goldman, et al. 2006 USA Peer-reviewed journal article	Longitudinal retrospective cohort study using an assembled dataset of pharmacy and medical claims from 1997 to2002 Logit model Socioeconomic and health condition covariates are included.	Fraction of fully compliant patients with cholesterol lowering therapy	Copayment	A 100% increase in copayment from \$10 to \$20 decrease the fraction of fully compliant patients by 6 to 10% depending on patient risk (p<.05)	Reliability :clear Internal validity: clear External validity: unclear	varying copayments for CL therapy by therapeutic need (eliminating copayment for high and medium risk patient and arising from \$10to \$22 for low risk patients)would reduce hospitalizations and EID use with total savings of more than \$1 billion annually.
Federman, et al. 2001 USA Peer-reviewed journal article	Cross-sectional using data from 1997 Medicare current beneficiary survey(MCBS) nationally representative survey of randomly	Statin use Beta blocker use	Medicare only coverage Vs. Employer-sponsored coverage	Significantly lower (4.1% vs. 27.4% p<0.001 OR 0.16 95%CI0.05-0.49 Significantly lower OR 0.55 95%CI0.34- 0.88p=0.001	Reliability :clear Internal validity: clear External validity: unclear	Elderly Medicare beneficiaries with CHD who lack drug coverage have disproportionately large drug expenditures and lower use rates of statins, a class of relatively

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal External validity (clear*, unclear**)	Conclusion and policy recommendation
	sampled Medicare beneficiaries					expensive drugs that improve survival.
Chernew, et al. 2008 USA Peer-reviewed journal article	Quasi experiment, pre post study design with control group (difference in difference design)	Medication adherence	Decreasing copayment From \$5 to zero for generic medication and 50% for brand- name drug	7-14 percent reduction in no adherence for four classes drug ($p < 0.001$) Elasticity Diabetic drugs -0.136 Statins -0.182 ACE inhibitors/ ARBs - 0.118 Beta blockers -0.112	Reliability :clear Internal validity: clear External validity: unclear	The result demonstrates the potential for copayment reductions for highly values services to increase medications adherence above the effect of existing DM programs.
Mochari, et al. 2007 USA Peer-reviewed journal article	Cross-sectional, Convenient sampling, voluntary participation Logistic regression, age, sex, race/ethnicity and education are included in the model	Knowledge of the optimal blood pressure goal Medication non adherence	Lack of health insurance	Significant OR 2.1 ;955 CI ,1.0-5.5 Significant $P = .01$	Reliability :clear Internal validity: clear although the selection bias can't be ruled out, Self-reported measures of medication adherence did not validate. External validity: unclear	Persons without health insurance have less knowledge about CVD risk factor control and they are less adherent to medical therapy.
Landsman, et al. 2005 USA Peer-reviewed journal article	Retrospective two sample cohort analysis(case and control group) among managed care enrollees using enrollment and	Prescription demand	3-tier pharmacy benefit design	MPR decreased switch rates increased and discontinuation rate increased in case group. Patients are most sensitive to NSAIDs, moderately	Reliability: clear Internal validity : clear External validity: unclear	Use of retail prescription medication decreased as copayment increased. Demand for pharmaceutical was relatively inelastic with

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
	pharmacy claims for 1999 to 2001			sensitive to SSRI and least sensitive to statins.		these copayment increases.
Huskamp, et al. 2003 USA Peer-reviewed journal article	Quasi experiment Using claim data from Medco Health Solutions from 01/1999 to 2001. Compare intervention and control group for two employer after implementing change in their formulary administration Descriptive analysis of changes in medications and terminations of treatment. Multivariate analysis of utilization and spending.	Discontinuation rate of ACE and statins	changed drug Copayment from \$7/\$15 to \$8/\$15/\$30	Dramatic increases in drug copayments were associated with higher rate of discontinuation of ACE (16.2% vs 6.4, p<0.001) and statins (21% vs 11, p=0.04)	Reliability: clear Internal validity : clear External validity: unclear	The associated changes in copayments due to different changes in formulary administration, can substantially alter out- of-pocket spending by enrollees, the continuation of the use of medications, and possibly the quality of care.
Cole, et al. 2006 USA Peer-reviewed journal article	Retrospective cohort study Using a two stage regression approach to model the association among copayment, adherence and patient outcome. Demographic, out-of- pocket cost, type of drug dispensed, are included.	Adherence to therapy with beta blockers or ACE for CHF patients	Drug copayment	A \$10 increase in drug was associated with a 2.6% decrease in the MPR for ACE (95% CI 2.0-3.1%) and a predicted 6.1% increase in the risk of hospitalization for CHF (95% CI .5-12.0%) A \$10 increase in copayment for beta blockers was associated with a 1.8 % decrease in MPR (95% CI 1.4-2.2%)	Reliability: clear Internal validity : clear External validity: unclear	Among patients with CHF, higher drug copayments were associated with poorer adherence. The change was relatively small and did not affect predicted total health care costs, but it was sufficient to increase the predicted risk of hospitalization for CHF. Physicians should review copayments with patients

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Pilote, et al. 2002 Canada Peer-reviewed journal article	Retrospective longitudinal cohort study Logistic regression analysis. Socioeconomic health condition covariates are included	The proportion of patients who received prescriptions for β -blockers, ACEs, lipid- lowering drugs Persistence of drug therapy	Inducing a 25% coinsurance (annual ceiling \$200,\$500 or \$750 depending on personal income) Inducing deductible from zero to \$350 depending on personal income Resulted in monthly payment range from \$16.67 to 62.50 for prescription drug	No significant change in proportion of patients , persistence , rate of readmission for complications, visits to emergency departments and mortality rate	Reliability: clear Internal validity : clear External validity: unclear	Prescriptions for essential cardiac medications and care related to acute myocardial infarction in elderly patients did not change with increases in out-of-pocket copayment, regardless of sex or socioeconomic status. and ensure that the cost to the patient does not lead to poor compliance. and a predicted increase in the risk of hospitalization for CHF (95% CI 3.8- 13.8%)
Cherkin, et al. 1990 USA Peer-reviewed journal article	Quasi experiment Treatment and comparable control group	Prescriptions for cardiovascular drug	Office visit copayment of \$5	Decreased by 4% (not significant)	Reliability: clear Internal validity: clear External validity: unclear	See "preventive services"
Choudhry, et al. 2007 USA Peer-reviewed journal article	Simulating a model, Using base line our puts and sensitivity analysis	Mortality and re-infarction rate of MI	Three years Full coverage of combination pharmacotherapy	Significant 26% increase compliance 1.1 fewer death for every 100 post MI patients	Reliability: clear Internal validity: unclear External validity: unclear	Three years of full coverage compared to standard coverage will reduce mortality and re- infarction rate and will save \$5974 per patients. So combination therapy coverage for this patient will save both live and money.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Choudhry, et al. 2008 USA Peer-reviewed journal article	Using a Markov cost effectiveness model using estimates from literature	Functional life expectancy	Full coverage	Significant Increase 0.35 QALY	Reliability: clear Internal validity: unclear External validity: unclear	Full coverage for post- myocardial infarction secondary prevention therapies from the perspective of Medicare is highly cost effective but not cost saving. From the societal perspective it would save both lives and money
Heisler, et al. 2004 USA Peer-reviewed journal article	Longitudinal panel using Health and Retirement study(HRS) and Asset and Health Dynamics Among the Oldest Old(AHEAD) study nationally representative Multivariate regressing adjusting for socioeconomic ,clinical and behavioral variables	Rate of angina , nonfatal heart attack or stroke Among people with cardiovascular disease who restricted medications	Cost related medication restriction	Higher rate of angina (11.9%vs. 8.2%;AOR, 1.50;CI,1.09-2.07) Higher rate of nonfatal heart attack or stroke than no restrictors(7.8% vs.5.3%;AOR,1.51;CI,1.02- 2.25)	Reliability : clear Internal validity : clear External validity : clear at national level(among older Americans)	Cost-related medication restrictions increase a subsequent decline in self- reported health status. Among cardiovascular patients it is associated with higher rates of angina and nonfatal heart attacks or strokes.
Piette, et al. 2004 USA Peer-reviewed journal article	Cross-sectional survey Multivariate regression controlling for Socio- demographic characteristics and the number of co morbilities	Patients reported cost related medication underuse	Type of health insurance	VA 9% Private insurance 18% Medicare 25% Medicaid 31% No health insurance 40% p<0.0001	Reliability : clear Internal validity : clear External validity: unclear	Cost-related adherence problems are especially common among patients with diabetes, with co morbid diseases, although the VA's drug coverage may protect patients from this increased risk.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Roblin, et al. 2005 USA Peer-reviewed journal article	Quasi experiment using a time series with comparison group Estimation of segmented time series regression on trends in OH use over 12 months. Age group, gender, imputed household income and concurrent insulin use are included as covariates	OH average daily dose (ADD)	A large ($\geq \$10$), moderate (\$7-10) and small (\$1- 6) increase in medication cost sharing	The large increase had significantly ($\alpha = 0.05$) decreased OH ADD by 18.5%	Reliability : clear Internal validity : clear External validity: unclear	Large increases in medication cost sharing were associated with immediate and persistent reductions in OH use. Small and moderate increases had little effect on OH use in the 6-month period after the increase.
Mahoney, et al. 2005 USA Report	Using data from Pitney Bowes prescription drug plan design	Adherence and use of fixed combination therapy among diabetic patients	Decrease in coinsurance rate for diabetes drug to 10% from 25-50%	The percentage of members using fixed combination oral hypoglycemic increased from 9% to 22 %,average total pharmacy costs decreased by 7% and overall medical costs decreased by 6%; ED visits decreased by 26%	Reliability : unclear Internal validity : unclear External validity: unclear	health managers may be able to improve care and limit overall costs for diabetes by selectively lowering barriers to appropriate pharmaceutical access.
Blustein, et al. 2000 USA Peer-reviewed journal article	Subjects participated in the 1995 Medicare Current Beneficiary Survey(MCBS), nationally representative longitudinal panel survey Logistic regression for	Failure to purchase any tablet Number of tablet purchased	Out-of-pocket cost	One dollar increase in the out-of-pocket per tablet cost resulted in the purchase of 114 fewer tablets per year. (p,.001)	Reliability : clear Internal validity : clear External validity: unclear	Drug coverage has a significant impact and lowers the likelihood that persons with hypertension will go without antihypertensive drugs.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
	outcome one and ordinary least square regression for outcome two A set of covariates are included					
Taira, et al. 2006 USA Peer-reviewed journal article	Retrospective observational analysis Using data from a large managed care organization from 1999 to 2004 Multivariate logistic regression A set of covariates (age, sex, race, morbidity level, type of insurance coverage) are included	Compliance with antihypertensive medication	Level of copayment \$20 to \$165 \$20V.s.\$5	OR 0.48 95% CI 0.47-0.49 OR 0.76 95% CI 0.75-0.78	Reliability : clear Internal validity : clear External validity: unclear(although the authors mention that their findings are valid and even generalizable)	Copayment is strong predictors of compliance with antihypertensive drugs. Patient use is sensitive to price so the potential impact on compliance should be considered when making pricing and policy decisions.
Johnson, et al. 1997 USA Peer-reviewed journal article	Pretest-posttest control group design(not random assignment)	Days of medication received, HMO prescription drug cost, exposure to a therapeutic class and overall health status	Small change in copayment(\$1 to \$3to \$5 for social HMO) And Coinsurance (from 50% to 70% for Medicare plus)	Did not appear to substantially affect outcome Large changes in copayment need further examination	Reliability: clear Internal validity : clear (Some concerns about internal validity are explicitly addressed) External validity: unclear	Increase in prescription drug copayment could adversely affect health status although more rigorous indicators of health status are needed. Research also is needed to fully assess the effects on use, costs, and outcome when copayments are large.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**, unclear***)	Conclusion and policy recommendation
Burke, et al. 2010 USA Peer-reviewed journal article	Retrospective claims analysis Coxproportional hazard regression analysis Patient demographic, clinical characteristic are included in the model	Medication adherence	Copayment >\$40 Vs. Copayment ≤\$20	Significant HR 1.320; 95% CI 1.091- 1.596;p<0.0042	Reliability : clear Internal validity : clear External validity: unclear	Higher medication copayment negatively impact patient persistence with Antiplatelet therapy
Wang, et al. 2006 China Peer-reviewed journal article	Retrospective survey on stroke patients. Retrospectively investigating a telephone follow up within one year after discharge Mann-Whitney U test	Compliance with antithrombotic agent	Medical insurance or free medical care	Significant OR 1.642 95%CI 1.004- 2.626	Reliability : clear Memory , reliability and medical knowledge of patients can influence the information collected via phone Internal validity : unclear External validity: unclear	Medical insurance and free medical care are able to promote compliance with medication in stroke patients for secondary prevention.
Losina, et al. 2009 Ivory coast Peer-reviewed journal article	Coupling from the Aconda program with the cost effectiveness or preventing AIDS complications(CEPAC) international simulation model From a payer perspective	Loss to follow up (LTFU) rate in HIV program	Intervention costing \$22/person/year(eliminating copayment for ART) Intervention costing \$77/person/year(eliminating copayment, personnel training and providing meal and reimbursement for traveling)	12% reduction in LTFU rate 41% reduction in LTFU rate	Reliability: clear Internal validity: clear(simulation model) External validity: unclear	Prevention LTUF strategies (like as eliminating copayment) in resource-limited setting would substantially improve survival and would be cost effective.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**, unclear***)	Conclusion and policy recommendation
Bisson, et al. 2006 Botswana Research letter	Retrospective cohort study Adjusting for potential confounders, including health insurance, regimen and laboratory values. Relative risk Wilcoxon rank sum	Undetectable viral load for HIV	Initial out-of-pocket cost for HAAART therapy	50% higher in those who did not achieve an undetectable viral load. Median \$32 IQR,20-84 vs. Median \$22 IQR,17-36 P=0.001	Reliability: clear Internal validity: clear (even the study claims that it supports causal relationship between out-of- pocket HAAART costs and virological response. External validity: unclear	Higher out-of-pocket payment is associated with failure to achieve a viral load <400 copies/ml. HAAART costs should be minimized as scale-up efforts in sub Saharan Africa progress.
Braitstein, et al. 2006 Africa,Asia,South America Europe, North America Peer reviewed journal article	Data from 18 HAAART Programs in Africa, Asia and South America(low income setting) and 12 cohort studies from North America and Europe(high income setting) Survival analysis	Mortality rate of HIV infected patients	Free of charge treatment	Significantly associated with lower mortality HR 0.23,95%CI 0.08-0.61	Reliability : clear Internal validity: Clear External validity: clear(because of a worldwide comparison)	The provision of treatment free of charge in low-income setting is associated with lower mortality.
Brinkhof, et al. 2008 Africa,Asia,South America Peer reviewed journal article	cohort study, data from 15 treatment programs in Africa, Asia, South America(IcDEA ART- LINK data base) Logistic regression. Competing risk models Age ,sex, laboratory data	Mortality and no follow up and lost to follow up rate of HIV	Fee for services Vs. Free of charge	Significantly associated with higher mortality HR 4.64 95%CI 1.11-19.41 Higher probability of no follow up OR 3.71 95%CL 0.97- 16.05	Reliability: clear Internal validity: clear External validity: unclear While the ART- LINK is representative of	Fee for service program is associated with higher probability of no follow up and higher mortality.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
	, clinical stage are included in the model					the types of ART services across low- income setting generalizability needs careful consideration because of limitation of data set with regard to the number of variables which is available of analysis.
Ramadhani, et al. 2007 Tanzania Peer reviewed journal article	Cross-sectional cohort study Using a structured questionnaire and adherence assessment Logistic regression Potential predictors of incomplete adherence are included in the model	Incomplete adherence for antiretroviral therapy for HIV	Months receiving self- funded treatment	Significant AOR,23.5p=.04	Reliability : clear Internal validity : clear External validity: unclear	Self-funded treatment is associated with incomplete adherence and virologic failure. Efforts to provide free antiretroviral therapy may enhance adherence and reduce rates of virologic failure.
Zachariah, et al. 2007 Kenya Peer reviewed journal article	Retrospective two cohort analysis (free plan and cost sharing plan)	Incidence rate for loss to follow up for HIV	Offering ART free of charge	Significant Overall risk reduction attributed to Offering ART free of charge was 56.6% (95% CI 20.0-76.5)	Reliability : clear Internal validity : clear External validity: unclear	Payment for ART is associated with a significantly higher rate of loss to follow up. ART should be offered free of charge in order to promote treatment

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
Preventive services						
Cherkin, et al. 1990 USA Peer-reviewed journal article	Quasi experiment Treatment and comparable control group	Comprehensive physical examination Primary care visits among users of cardiovascular medications Cancer screening	Office visit copayment of \$5	Decreased by 14% ($p < 0.0001$) Decrease by 20 % ($p < 0.0001$) Not significant	Reliability: clear Internal validity: clear External validity: unclear	Copayment results in a 14% decrease in physical examinations but did not significantly affect immunization rates for young children, cancer screening tests received by women, or medication use by persons with cardiovascular disease. For employed populations small copayments appear to have little impact on the most valuable types of preventive care services.
Solanki, et al. 1999 USA Peer-reviewed journal article	Survey obtaining data from the 1994 Pacific Business group on Health(PBGH) annual random sample of employees. Response rate 50.31% 16 logit model to assess variation in receiving preventive services Controlling for health	Utilization of recommended preventive services	Copayment Conscience / Deductible	Negative effect on preventive counseling in PPO/indemnity plan (- 15%) On mammogram in all health plan type (-9%- 10%) On pap smear (-8%-10%) for deductibles / conscience in	Reliability: clear Internal validity : clear (concerns about it are addressed clearly) External validity: unclear Although the study examines the effects of	Eliminating patient cost sharing for selected preventive services may be a relatively easy and effective means of increasing utilization of recommended clinical preventive care.

compliance and prevent
the emergence of drug
resistance.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal validity External validity (clear*, unclear**)	Conclusion and policy recommendation
	status, functional status, age, gender, family income, education, smoking status			PPO/indemnity plan and copayments in HMOs. The effect on blood pressure was mixed. Deductible and coinsurance had a greater negative effect than copayments	cost sharing in a range of health plans with a variety of the financial and organizational structure which make its external validity strong, generalizability of the result to less affluent or educated and uninsured people must be done with careful consideration	
Solanki, et al. 2000 USA Peer-reviewed journal article	Survey obtaining data from the 1994 Pacific Business group on Health (PBGH) annual random sample of employees. Response rate 50.31% Five equation derived to estimate the indirect and direct effects of cost sharing using Probit model	Utilization of recommended preventive services	Copayment Coinsurance / Deductible	Both form had negative and significant indirect effects on preventive counseling (from -1% to - 7%) Direct effect for preventive counseling -5% to -9% and for pap smear -3% to -9% in both HMOs and PPOs and for mammogram only in PPOs (-3% to -9%)	Reliability: clear Internal validity : clear (concerns about it are addressed clearly) External validity: unclear Suggesting to test the model on another sample of employees of	Both the direct and indirect effects of cost sharing negatively affected the receipt of preventive counseling in HMOs and PPOs. Eliminating cost sharing for these services may be important to increasing their utilization to recommended levels.

Reference/ country of origin of data/type of publication	Study design	Outcome variables	Indicator of out-of-pocket payment	Impact	Reliability Internal External validity (clear*, unclear**)	Conclusion and policy recommendation
Faulkner, et al. 1997 USA Peer-reviewed journal article	Using data from BRFSS a cross-sectional, state- based, random –digit dialing telephone survey Logistic regression used controlling for insurance coverage foe hospital , health status, and Socio- demographics	Blood pressure Cholesterol level Preventive check up pap smear CBE Mammogram All services	Level of insurance coverage for preventive services (All, Most, Some)	OR for men with full coverage (all) 1.8 to 2.8 OR for women with full coverage (all) 1.2 to 2 OR for men with” most” plan 1.3 to 2.1 and for women 1.2 to 2	Reliability: clear Internal validity: clear External validity: unclear	Comprehensive health insurance coverage for clinical preventive care may significantly increase receipt of recommended preventive services for this population.
Lurie, et al. 1987 USA Peer-reviewed journal article	experiment Using data from health insurance experiment Analysis of variance methods Two tailed t test	Pap smear	Cost sharing plan Vs. Free plan	Women 17-44 received pap smear from 72.2 to 62.6 and women 45-65 from 65 to 51.9	Reliability: clear Internal validity: clear External validity: clear only in national level	Free care alone, while significant, is not a sufficient incentive to providing recommended levels of preventive care.

*clear: reliability, internal and external validity are discussed in the study or it is easy to be understood from information the study provides.

**unclear: reliability, internal and external validity are not discussed in the study or it is not easy to be understood from information the study provides or the study itself expresses doubt about them.

Appendix D

Description of variables used in Chapter 3

Variables & coding used in the analysis	Original variables in the SHARE dataset	Variable description
Dependent variable		
Current daily smoking 0= no 1= yes	BR001&BR002	This variable indicates whether the participant is daily smoker. Participants were first asked if they had ever smoked cigarettes, cigars, cigarillos or a pipe daily for a period of at least one year. If they replied in the affirmative, they were asked whether or not they smoked at present time. Respondents who answered “yes” to both questions are classified as current daily smoker.
Excessive alcohol use 0= no 1= yes	DRINKIN2	This variable indicates the cases of heavy drinking defined by SHARE as drinking more than two glasses of any of the three main drinks (i.e. beer, wine, hard liquor) almost every day or five/six days a week. The variable is constructed by SHARE based on variables BR011, BR012, and BR013. These variables contain information on the frequency of drinking more than two glasses of beer, wine and hard liquor respectively. To collect data for variable BR011, the following question was asked: “During the last six months, how often have you had more than two glasses or cans of beer or cider in a single day?” The following response options were given: 1. Almost every day; 2. Five or six days a week; 3. Three or four days a week; 4. Once or twice a week; 5. Once or twice a month; 6. Less than once a month; 7. Not at all in the last 6 months. The framing of the questions and response categories for variables BR012 and BR013 were analogous.
Physical inactivity 0= no 1= yes	PHACTIV	This variable indicates the presence of physical inactivity. It is constructed by SHARE based on variables BR015 and BR016. Physical inactivity is defined as never or almost never engaged in neither moderate nor vigorous physical activity as defined by the following questions: BR015 SPORTS OR ACTIVITIES THAT ARE VIGOROUS “How often do you engage in vigorous physical activity, such as sports, heavy housework, or a job that involves physical labor?” BR016 ACTIVITIES REQUIRING A MODERATE LEVEL OF ENERGY “How often do you engage in activities that require a low or moderate level of energy such as gardening, cleaning the car, or doing a walk?” For both questions, the response categories were defined as follows: 1. More than once a week; 2. Once a week; 3. One to three times a month; 4. Hardly ever, or never.
Independent variables		
Education 1=ISCED 1 2=ISCED 2 3=ISCED 3 4=ISCED 5	Isced_r	This variable shows the level of participant's education according to the 1997 International Standard Classification of Education (ISCED-97) which is used by SHARE for international comparison. In the Netherlands, the name of the degree mentioned by the participant during the interview was mapped by the local experts to the respective ISCED coding.
Annual gross household income quintile Ranging from 1= lowest quintile to 5= highest quintile	hginevc	This variable provides information on annual gross household income of the participant in 2004. It is generated by SHARE and includes all source of income for each individual in the household (i.e. income from employment and self-employment, all types of pensions, income from rent) and also other sources of income at a household level (i.e. household interest income from bank accounts, bonds, or mutual funds). We use the quintile of this variable in our model as independent variable.

Variables & coding used in the analysis	Original variables in the SHARE dataset	Variable description
Self-perceived health Ranging from 1= poor to 5= excellent	SPHUS	This variable is based on variables PH003&PH0052 in the SHARE dataset, which contains responses to the following question: “Would you say your health is: 1. Excellent; 2. Very good; 3. Good; 4. Fair; 5. Poor?” For more convenient interpretation we use the reversed order of this variable in our model so that the higher number shows higher perceived health status.
Global Activity Limitation Index 0= not limited 1= limited	GALI	This variable is generated by SHARE and it indicates the global activity limitation index of a participant. It is based on variable PH005 in the SHARE dataset, which was obtained using the following question: “For the past six months at least, to what extent have you been limited because of a health problem in activities people usually do?” The response categories were: 1. Severely limited; 2. Limited, but not severely; 3. Not limited. Thus, variable GALI dichotomizes these three response categories into two categories of limited (sever and not sever) and not limited activities due to health problems.
Social compulsory insurance 0= no 1= yes	HC057	This variable indicates whether the participants were covered by the National Health Insurance System in 2004 (i.e. whether they had compulsory social health insurance). Those who replied in affirmative are classified as individuals with social compulsory health insurance in 2004.
Private health insurance 0= no 1= yes	HC059d5,HC059d6,HC059d7	These variables indicate whether the participants with no compulsory social health insurance had any type of private insurance in 2004. Those who replied in positive are considered as having private insurance in 2004.
No insurance 0= health insurance 1= no health insurance	HC057&HC059dno	This variable indicates those who had no health insurance in 2004. Thus, those who had no social health insurance (HC057 = 0) and had no private health insurance (HC059dno = 1), are classified as having no insurance at all in 2004.
Better self-perceived health 0= worse or the same health 1= better health	PH062	This variable indicates whether the health status of the participant became better in 2007 compared to 2004. In particular, participants in wave 2007 were asked the following: “Compared with your health when we talked with you in (month and year previous interview), would you say that your health is better now, about the same, or worse?” The response options were: 1. Better; 2. About the same; 3. Worse. Thus, those who chose the first option are classified as having better health status in 2007.

Variables & coding used in the analysis	Original variables in the SHARE dataset	Variable description
Worse self-perceived health 0= better or the same health 1= worse health	PH062	This variable indicates whether the health status of the participant became worse in 2007 compared to 2004. It is constructed using the responses to the same question as for variable PH062. Thus, those who chose option 3. Worse, are classified as having worse health status in 2007.
Non-limited GALL compared to 2004 0= limited or the same 1= non-limited	GALL	This variable indicates whether the limitation due to health problems was lower in 2007 compared to 2004. It is constructed by comparing the variables GALL (see above) in wave 1 and wave 2 and it shows the change in the global activity limitation index for each respondent between the two waves. Thus, those who had limitations with activity due to health problems in 2004 (GALL in wave 1 = 1) but had no such limitations in 2007 (GALL for wave 2 = 0), are classified as non-limited GALL in 2007.
Limited GALL 0= non-limited or the same 1= Limited	GALL	This variable indicates whether the limitation due to health problems was higher in 2007 compared to 2004. It is constructed in an analogous way as variable non-limited GALL. Thus, those who had no limitations with activity due to health problems in 2004 (GALL in wave 1 = 0) but had such limitations in 2007 (GALL for wave 2 = 1), are classified as limited GALL in 2007.
Better health insurance coverage 0= worse or the same coverage 1= better coverage	HC069	This variable indicates whether the insurance coverage of the participant became better in 2007 compared to 2004. In particular, participants in wave 2007 were asked to compare their health insurance coverage with the one they have had during wave 2004 (previous interview). The question was framed as follows: "We are interested in how your health insurance may have changed since our last interview in [(month year previous interview)]. Taking all your social and health insurances into account, has anything changed, for better or for worse, in your coverage for health problems since [(month year previous interview)]?" The following response options were given: 1. No change; 2. Better coverage now; 3. Worse coverage now.
Worse health insurance coverage 0= better or the same coverage 1= worse coverage	HC069	Thus, those who chose the second option are classified as having better coverage in 2007. This variable indicates whether the insurance coverage of the participant became worse in 2007 compared to 2004. It is constructed using the responses to the same question as for variable HC069_better. Thus, those who chose option 3. Worse coverage, are classified as having worse coverage in 2007.
Health insurance deductible Measured in euro	HC054	This variable contains the responses to the question that asked participants to mention the amount of their health insurance deductible.

Appendix E

Results of multinominal logistic regression in Chapter 3

Table E.1 *Multinomial logistic regression for daily smoking*

<i>Explanatory variables</i>	Stop daily smoking in 2007			Continue daily smoking in 2007			Start daily smoking in 2007		
	OR	L	U	OR	L	U	OR	L	U
Age 56-64	1.09	0.60	2.00	0.70*	0.51	0.97	1.75	0.70	4.35
Age 65-74	0.54	0.25	1.15	0.37**	0.25	0.54	0.43	0.13	1.46
Age ≥75	0.06**	0.01	0.50	0.23**	0.14	0.40	0.60	0.16	2.31
Gender	0.57*	0.33	0.97	0.80	0.61	1.05	1.30	0.62	2.71
Marital status	2.06	0.79	5.37	0.63**	0.45	0.89	0.72	0.29	1.79
Change in marital status	0.00	0.00		1.17	0.56	2.45	1.74	0.37	8.15
Education	0.84	0.62	1.14	0.81*	0.69	0.95	1.05	0.69	1.60
Annual HH gross income quintile	1.04	0.82	1.33	0.98	0.86	1.11	0.75	0.53	1.08
Perceived health	1.05	0.78	1.41	0.75**	0.64	0.88	0.57*	0.36	0.91
Better perceived health	0.84	0.25	2.84	0.54*	0.30	0.98	1.47	0.46	4.68
Worse perceived health	3.30**	1.81	6.01	1.04	0.74	1.45	1.52	0.64	3.62
GALI (<i>Global Limitation Index</i>)	0.59	0.27	1.32	0.72+	0.49	1.06	0.22*	0.06	0.85
Non-limited GALI	1.81	0.75	4.39	0.88	0.55	1.41	6.71**	1.79	25.17
Limited GALI	1.14	0.56	2.32	1.25	0.86	1.83	2.46+	0.98	6.18
Health insurance deductible	1.09	0.85	1.40	0.88+	0.76	1.02	1.12	0.78	1.59
Private insurance	0.13*	0.02	0.97	0.39*	0.16	0.94	0.28	0.03	2.42
Better health insurance coverage	0.38+	0.13	1.08	0.66+	0.42	1.04	0.16+	0.02	1.25
Worse health insurance coverage	0.98	0.40	2.41	0.82	0.49	1.37	0.27	0.04	2.06
<i>Interaction</i>									
HH income quintile* Private insurance	1.50	0.92	2.43	1.25+	0.99	1.58	1.41	0.78	2.55
N (included in analysis)	1533								

The base group for multinomial regression is those who are not daily smoker in 2004 and 2007; the age groups are compared to age ≤55

**significant at 1%level; *significant at 5% level; + significant at 10%/level

Table E.2 *Multinomial logistic regression for excessive alcohol use*

Explanatory variables	Stop excessive alcohol use			Continue excessive alcohol use			Start excessive alcohol use		
	OR	95 % CI	U	OR	95 % CI	U	OR	95 % CI	U
Age 56-64	1.47+	0.98	2.21	1.24	0.73	2.11	1.54	0.75	3.19
Age 65-74	1.02	0.62	1.67	1.02	0.55	1.89	0.95	0.40	2.28
Age ≥ 75	0.67	0.34	1.33	0.54	0.23	1.29	0.24+	0.05	1.14
Gender	0.70*	0.50	0.99	0.31**	0.19	0.50	0.33**	0.17	0.63
Marital status	1.09	0.67	1.77	1.44	0.75	2.77	0.54+	0.26	1.11
Change in marital status	0.76	0.26	2.20	0.00	0.00		0.67	0.08	5.35
Education	1.15	0.94	1.40	1.11	0.87	1.43	1.37+	0.96	1.94
Annual HH gross income quintile	1.10	0.93	1.30	1.05	0.84	1.31	0.92	0.68	1.26
Perceived health	1.19+	0.99	1.44	0.94	0.73	1.21	0.96	0.68	1.36
Better perceived health	0.78	0.38	1.63	1.09	0.47	2.53	0.90	0.26	3.11
Worse perceived health	1.20	0.79	1.83	0.88	0.51	1.53	1.47	0.71	3.02
GALI (Global Limitation Index)	0.94	0.56	1.55	1.07	0.56	2.02	0.77	0.32	1.88
Non-limited GALI	1.07	0.59	1.94	1.17	0.57	2.40	1.45	0.52	4.00
Limited GALI	1.60*	1.02	2.50	1.88*	1.06	3.34	1.28	0.56	2.94
Health insurance deductible	1.06	0.91	1.25	0.99	0.80	1.22	1.02	0.77	1.35
Private insurance	0.23*	0.07	0.73	1.24	0.37	4.18	0.52	0.09	3.05
Better health insurance coverage	1.04	0.64	1.69	0.43+	0.18	1.02	1.17	0.50	2.75
Worse health insurance coverage	0.66	0.32	1.35	1.80+	0.93	3.51	1.59	0.60	4.25
Interaction									
HH income quintile* Private insurance	1.48**	1.11	1.97	1.04	0.75	1.45	1.24	0.77	2.01
N (included in analysis)	1533								

The base group for multinomial regression is those who are not excessive alcohol users in 2004 and 2007, Age groups are compared to age ≤ 55

**significant at 1% level; *significant at 5% level; +significant at 10% level

Table E.3 Multinomial logistic regression for physical inactivity

<i>Explanatory variables</i>	Stop physical inactivity			Continue physical inactivity			Start physical inactivity		
	OR	L	95 % CI	OR	L	95 % CI	OR	L	95 % CI
Age 56-64	0.76	0.26	2.28	2.22	0.44	11.29	1.21	0.58	2.53
Age 65-74	2.32+	0.86	6.26	1.69	0.28	10.06	1.61	0.75	3.44
Age ≥ 75	4.81**	1.62	14.28	6.63*	1.25	35.21	2.97**	1.30	6.76
Gender	1.84+	0.89	3.80	1.47	0.58	3.69	1.73*	1.04	2.89
Marital status	1.66	0.69	3.98	0.70	0.26	1.91	1.32	0.71	2.47
Change in marital status	2.21	0.57	8.56	2.02	0.23	18.09	2.14	0.79	5.76
Education	1.06	0.70	1.61	0.85	0.50	1.45	0.65**	0.48	0.88
Annual HH gross income quintile	1.01	0.73	1.39	1.06	0.67	1.66	0.98	0.77	1.26
Perceived health	0.33**	0.20	0.53	0.32**	0.17	0.63	0.53**	0.38	0.73
Better perceived health	1.47	0.46	4.66	0.00	0.00		0.51	0.12	2.19
Worse perceived health	0.73	0.33	1.60	3.02*	1.09	8.39	1.90**	1.19	3.32
GALI (<i>Global Limitation Index</i>)	0.95	0.36	2.47	1.41	0.31	6.34	1.84	0.84	4.05
Non-limited GALI	0.47	0.15	1.50	0.29	0.03	2.39	0.65	0.29	1.46
Limited GALI	1.14	0.39	3.32	1.29	0.24	6.94	3.11**	1.45	6.66
Health insurance deductible	0.75	0.46	1.24	1.06	0.64	1.76	0.93	0.70	1.25
Private insurance	2.33	0.35	15.43	2.71	0.24	30.90	1.46	0.38	5.54
Better health insurance coverage	1.77	0.63	4.94	0.43	0.05	3.46	0.90	0.40	2.01
Worse health insurance coverage	0.79	0.21	2.89	0.00	0.00		0.33+	0.10	1.13
<i>Interaction</i>									
HH income quintile* Private insurance	0.77	0.43	1.36	0.84	0.40	1.77	1.09	0.74	1.61
N (included in analysis)	1533								

The base group for multinomial regression is those who are not physically inactive in 2004 and 2007; the age groups are compared to age ≤ 55
 **significant at 1% level; *significant at 5% level; +significant at 10% level

Appendix F

Results of OLS regression in Chapter 4

Appendix F

OLS estimates

Model	Living with partner		Living without partner	
	<i>Female</i>	<i>Male</i>	<i>Female</i>	<i>Male</i>
Daily smoking	-0.046 (0.044)	-0.048 (0.039)	-0.053 (0.062)	-0.013 (0.082)
Age	0.005* (0.002)	0.007*** (0.002)	-0.002 (0.002)	0.001 (0.004)
Years of education	-0.021*** (0.004)	-0.019*** (0.004)	-0.027*** (0.006)	-0.010 (0.008)
LN Hhd income	0.008 (0.019)	0.017 (0.020)	-0.016 (0.028)	-0.011 (0.039)
If child aged ≤18 in the household	0.030 (0.060)	0.079 (0.058)	0.207 (0.110)	-0.180 (0.165)
Self-perceived health	-0.007 (0.018)	-0.004 (0.018)	-0.087*** (0.026)	-0.087* (0.039)
Global limitation index(GALI)	0.058 (0.054)	0.022 (0.054)	-0.046 (0.065)	0.076 (0.107)
Austria	-1.980*** (0.098)	-2.208*** (0.098)	-1.856*** (0.123)	-2.197*** (0.196)
Germany	-2.262*** (0.074)	-2.283*** (0.075)	-2.278*** (0.123)	-2.528*** (0.179)
Spain	-0.861*** (0.079)	-0.877*** (0.081)	-0.662*** (0.130)	-0.701*** (0.189)
Italy	-2.051*** (0.071)	-1.920*** (0.073)	-1.910*** (0.125)	-1.419*** (0.187)
France	-1.687*** (0.075)	-1.598*** (0.076)	-1.588*** (0.110)	-1.250*** (0.165)
Denmark	-1.365*** (0.076)	-1.439*** (0.078)	-1.274*** (0.118)	-1.212*** (0.167)
Greece	-1.929*** (0.072)	-1.919*** (0.073)	-2.134*** (0.114)	-1.904*** (0.179)
Switzerland	-2.878*** (0.090)	-2.891*** (0.092)	-2.905*** (0.128)	-2.840*** (0.191)
Belgium	-3.703*** (0.071)	-3.707*** (0.072)	-3.797*** (0.113)	-3.578*** (0.164)
Czech Republic	-1.198*** (0.076)	-1.178*** (0.079)	-1.265*** (0.112)	-1.194*** (0.165)
Poland	-2.179*** (0.079)	-2.175*** (0.082)	-2.318*** (0.128)	-2.049*** (0.191)
Constant	15.539*** (0.256)	15.342*** (0.272)	16.497*** (0.353)	15.946*** (0.495)
N	10511	10379	5539	2340

Standard error in parenthesis; * p value ≤ 0.05 ** p value ≤ 0.01 *** p value ≤ 0.001

Summary

Patient payments and health behaviors: stick or carrot?

Out-of-pocket payments are seen as an efficiency improving tool to discourage moral hazard. Moral hazard refers to the incentive for individuals that are covered by health insurance to change their behavior in ways that increase the risk of loss for the insurer. Two types of moral hazard behavior can be distinguished: first, ex-ante moral hazard that refers to the incentive for insured individuals to behave in a riskier manner creating more health problems; second, ex-post moral hazard that refers to the incentive for insured individuals to overuse health care services offered under the insurance benefit package. In view of this, two tradeoffs can be formulated: first, a tradeoff between out-of-pocket payments and unhealthy behavior, which results from the potential of out-of-pocket payments to discourage ex-ante moral hazard; second, a tradeoff between out-of-pocket payments and the use of preventive services, which results from the potential of out-of-pocket payments to discourage ex-post moral hazard. In other words, out-of-pocket payments have a double effect on prevention. On the one hand, they can reduce the demand for preventive services; while on the other hand, they may encourage individual lifestyle change toward a healthier lifestyle. The latter is the focus of this dissertation.

In the empirical literature, the negative effect of out-of-pocket payments on the use of preventive services is well documented. However, the extent to which out-of-pocket payments might encourage health behavior is not evident yet. In fact, the practical significance of ex-ante moral hazard in health insurance is still debated. Moreover, it is difficult to separate moral hazard from adverse selection that refers to the fact that individuals with a higher (perceived) health risk tend to purchase more health insurance or a more extensive coverage. Without accounting for adverse selection, any estimate of moral hazard effect would be biased. Thus, due to moral hazard, health behavior can be negatively affected by the level of insurance coverage. However, due to adverse selection, the level of insurance coverage can be determined by health behavior.

Health behavior can be broadly defined as any action or inaction which affects individuals' health. In this dissertation, we have restricted ourselves to the three most common forms of unhealthy behavior (i.e. smoking, excessive alcohol use and physical inactivity) that are among the top leading risk factors of mortality and morbidity worldwide.

As outlined in **Chapter 1**, among policymakers worldwide there is a consensus on the urgent need to promote prevention through lifestyle changes.

With increased health care spending (especially because of the prevalence of non-communicable disease), there are those who advocate shifting more of the costs to the demand side by introducing more out-of-pocket payments especially for health care services that would not be used should individuals behave in a healthier manner. By exploring the tradeoff between out-of-pocket payments and prevention, this dissertation provides evidence that can help policymakers to make more informed decisions based on widely accepted principles of solidarity, equity, access, and freedom of choice.

This dissertation aims to study how and to what extent health-related behavior and health care cost coverage are related. Health care cost coverage refers here to both coverage provided by private insurance and social insurance.

This dissertation is based on a series of studies that examine the relationship between the extent (type) of health insurance coverage and health behavior. Chapter 2 is based on a systematic literature review of existing empirical evidence on the impact of health care cost coverage on health behavior. The next three chapters (Chapters 3, 4, 5) provide empirical evidence on the effects of health insurance on health behavior or vice versa. They employ quantitative techniques on data from the Survey of Health, Aging, and Retirement in Europe (SHARE). SHARE is the European longitudinal aging survey, similar to the US Health and Retirement Study (HRS) and the English Longitudinal Study of Aging (ELSA), which provides micro data on health, socioeconomic status and social and family networks of more than 85000 individuals from 19 European countries aged 50 or over. Chapter 6 discusses the main findings outlined in previous chapters.

In **Chapter 2** we systematically review empirical evidence on the effects of out-of-pocket payments on the use of preventive services and health-related lifestyle. All possible combinations of three key words “prevention”, “patient payment” and “health-related behavior” are used for search in PUBMED, ECONLITH, ECONPAPER and EMBASE. There is no limitation to the year of publication and geographical region. However, only English language publications are included. The reference lists of the publications are also reviewed. In total, 47 relevant publications are identified. Most studies, 31 out of 47 publications, originate from the US, and only two studies originate from Europe (one from Germany and one from UK).

Our results confirm the double effect of out-of-pocket payments on prevention. They reduce the demand for preventive services; and at the same time, they have the potential to encourage preventive activities such as a healthier lifestyle. However, we find that the effect of out-of-pocket payments on preventive

services is a lot more studied than the effect of out-of-pocket payments on lifestyle. There is strong evidence that in case of secondary prevention, out-of-pocket payments present a financial barrier by decreasing adherence to medication and preventive services. However, the few studies that address the theory of ex-ante moral hazard and test the impact of insurance on healthy behavior come to different conclusions. Thus, even though, healthy behavior can be promoted by different incentives, the role of health insurance coverage and out-of-pocket payments are still not empirically established.

The review in Chapter 2 also suggests that most evidence so far on this topic comes from the US. Although ex-ante moral hazard is more probable to exist in a publicly financed system (e.g. many European countries), we find few studies on the topic in Europe. The great diversity of study designs (various indicators of out-of-pocket payments and preventive/health-related behavior) makes it difficult to offer robust policy recommendations. Nevertheless, our findings support calls to reconsider how preventive services should be financed. More research is needed to explore the actual impact of cost-sharing on different aspects of health-related lifestyles, as well as to explain the role of other relevant determinants that could impact this relationship.

As outlined in **Chapter 3**, previous studies have mostly focused on socio-demographic, socioeconomic, and health-related determinants of health-related behaviors. Although comprehensive health insurance coverage could discourage individual lifestyle improvement due to ex-ante moral hazard problem, few studies have examined such effect.

Therefore, Chapter 3 examines the association of a comprehensive set of factors including socio-demographic, socioeconomic, health status, health insurance and perceived change in health insurance coverage with health-related behaviors and their dynamics. The goals are, first to explore factors, including health insurance, associated with the state and dynamics of unhealthy behavior; second to investigate the consistency of their effects across different types of behavior as well as across the state and the dynamics of one behavior. SHARE data for the Netherlands in 2004 and 2007 (before and after the health insurance reform in the country) are used to model health-related behaviors in 2004 (daily smoking, excessive alcohol use and physical inactivity) and their corresponding changes (stopping or starting unhealthy behavior) between 2004 and 2007.

The results of this case study for the Netherlands are not supportive for the existence of ex-ante moral hazard, and even imply the contrary. For instance, should ex-ante moral hazard exist, we expect that a positive change in health

insurance coverage (having a better coverage in 2007) leads to a negative change in health behavior (e.g. start smoking, excessive alcohol use or physical inactivity). However, our results show the opposite, as we find that better perceived health insurance coverage is associated with stopping alcohol use. We also find that those with better perceived health insurance coverage are less likely to continue daily smoking and excessive alcohol use, while those with worse perceived health insurance coverage are more likely to continue excessive alcohol use. Also, we find that having voluntary private insurance is positively associated with daily smoking and excessive alcohol use. At the time the data were collected, the voluntary private insurance in the Netherlands often provided less generous coverage than compulsory social insurance. In view of this, these findings also seem to contradict the notion of ex-ante moral hazard.

In Chapter 3, we also show that health behavior is not a uniform concept, and each behavior deserves separate attention. In particular, our results show that each behavior has its own set of covariates. Even when there are some determinants in common, their effects might be in different direction. For instance, we find that women are less likely to smoke daily and to excessively use alcohol but at the same time are more likely to be physically inactive. The same applies for the dynamics of health behaviors.

Our results provide input to target policies towards elderly individuals in need of lifestyle change. More effort is needed to target men and affluent people to quit smoking and excessive alcohol use, as well as women and the elderly to become physically more active. However, regarding the effect of the type of health insurance on the state of unhealthy behavior, given the specifics of the Dutch health insurance system in 2004, a clear conclusion cannot be drawn about the applicability of the ex-ante moral hazard interpretation.

In **Chapter 4**, exploiting SHARE data for 12 European countries, an instrumental variable strategy is used to identify the causal effect of daily smoking on health care cost coverage. Daily smoking is instrumented by a variable indicating whether or not there is any other daily smoker in the household. Health care cost coverage is measured by a variable on a scale of 4-16 which indicates self-assessed health care cost coverage by individuals (from no coverage to full coverage). This variable can comprehensively encompass all three dimensions of health care cost coverage (namely breadth, scope, and depth). Thus, it is more informative about the extent of health insurance coverage than variables used in the other studies like the probability of purchasing a private insurance or the amount of health insurance coverage.

We find that daily smoking decreases self-assessed health insurance coverage among women and men who live without a partner. These findings replicate the same counter-intuitive relationship between smoking and health insurance presented in previous studies, but in a language of causality. Consistent with previous studies, these findings can be explained by heterogeneity in risk aversion. In other words, risk aversion is unobservable which drives the negative effect of smoking on health insurance coverage. In this sense, the more risk-averse individuals are, the healthier the lifestyle they have, and at the same time the more extensive health insurance coverage they will choose.

As outlined in Chapter 4, adverse selection occurs when individuals have a choice whether or not to buy health insurance. With choice, a positive relationship between (health) risk and insurance coverage can be expected. Accordingly, we expect to see more effect of smoking on health care cost coverage in countries where there is more choice of health care cost coverage. However, our results show that the negative effect of smoking on health coverage is more evident in countries where there are fewer possibilities of choice. One plausible explanation instead of risk aversion can be more out-of-pocket expenditures among smokers in these countries.

As outlined in **Chapter 5**, in a solidarity based health care system, such as those in European countries, the costs of unhealthy behavior are incurred by all citizens and not only by those who make the costs. This issue has been criticized, as it seems unfair that the costs of a choice for an unhealthy behavior are paid for by those who have chosen for a healthy lifestyle. Thus, there is an ongoing debate about incorporating some elements of individual responsibility in the health care system and providing incentives for better health-related behavior. In doing so, a carrot and stick approach can be used to reward desired behavior and to punish undesired one; carrots like discounts in premiums, and sticks like copayments.

In Chapter 5, we address two questions: whether or not an unhealthy lifestyle is associated with more utilization of health care, and whether the extra cost of more use of health care are paid out of pocket by those who engage in unhealthy behaviors (i.e. daily smoking, excessive alcohol use, obesity, and overweight). Using SHARE data from 12 European countries, we employ a sequential logit model to investigate how the utilization of outpatient and inpatient care and out-of-pocket payments for them is associated with health-related behavior. We also use a two part model to study the association between out-of-pocket payments for prescribed drugs and health-related behavior.

We do not find systematic evidence that unhealthy behavior is associated with more utilization of health care and more out-of-pocket payments. The most consistent pattern among the elderly in the included countries appears in case of smoking. It shows that former smoking is associated with a higher rate of health care use. In contrast, current smoking is associated with a lower rate of health care use.

These findings can have important policy implications regarding a stick and carrot approach for individual responsibility for health. It shows that people at the time of engaging in an unhealthy behavior (i.e. current smoking, heavy drinking) are not using more health care than those who do not engage in respective behavior. Thus, using a stick like copayment might not encourage them to quit. However, when people are in need of health care, resulting in more use of health care, they are most probably not engaging in unhealthy behavior (i.e. ex-smoking). Thus, using a stick like copayment would limit access to health care for those who need it and this contradicts the principles of equity and solidarity. Our findings per country can be of use for further studies on the causes of cross-country differences in out-of-pocket payments.

Chapter 6 discusses the main findings outlined in previous chapters (Chapters 2-5) in the forms of six statements to achieve the aim of dissertation stated in Chapter 1.

As discussed in this chapter, out-of-pocket payments are a double edged sword for prevention. They reduce the demand for preventive services, and at the same time, they have the potential to encourage preventive activities such as a healthier lifestyle. However, despite the evidence on the negative effect of out-of-pocket payments on the use of preventive services, their positive effects on health behavior are not empirically established.

We have also argued that ex-ante moral hazard seems not to be a very strong driving force for individuals not to invest in prevention. Thus, policymakers should not be so worried that insurance coverage for preventive services and facilities which make preventive activities more feasible would lead to less prevention. Therefore, subsidizing primary prevention and providing financial incentives to engage individuals in a healthier lifestyle can be recommended.

As explained in Chapter 6, when using health behavior (e.g. smoking) as a proxy for health risk, there is more consistent evidence against the existence of adverse selection. Thus, adverse selection does not seem to be a strong driving force for those who engage in unhealthy behavior to opt for more extensive coverage, but mostly for risk-averse individuals.

Summary

We also show that in a carrot and stick approach to promote health behavior, the potential of out-of-pocket payments as a stick is doubtful. Charging more out-of-pocket payments for health care use of those who currently engage in unhealthy behavior (e.g. current smokers) might not be justified by lifestyle solidarity as they are not likely to use health care more than others (e.g. never smokers). However, when out-of-pocket payments might be justifiable for policies to diminish lifestyle solidarity for instance in case of ex-smoking, it raises lots of ethical concern because it could deprive individuals from their basic needs. An alternative to out-of-pocket payments is to set a higher insurance premium for those who engage in unhealthy behaviors. This higher premium can spare more funds for the future when the adverse health effects of unhealthy behavior appear, and thus may result in more health care used. In addition, a higher premium can be set for unhealthy behavior irrespective of actual health care use. Thus, they can be seen not only as a stick but as limit to lifestyle solidarity without compromising the provision of basic needs.

Words of Thanks

I am very grateful to Allah for his countless blessings and strength provided me to witness a closure of my PhD track. This is the final destination of this PhD journey, and as usual for any journey, it is time to look back, recall and talk about moments I had along this journey: moments that brought me friends and family joy, and those that thought me new lessons for my life. Writing about all those moments in this journey which took 52 months and 2 weeks of my life needs a much volumes book. I wish it was obligatory to write that book so I could not skip it. However, in order to get the PhD diploma, it is obligatory to only write about my academic part of the PhD journey. At the end of each journey, it is also the time to thank all people whose help and support made the journey possible, memorable and enjoyable. I am happy that, at least, I can have this section in the dissertation to name some of those who unfailingly helped me in this long trip, and express my heartfelt gratitude towards them.

My PhD journey would not have been started if Mehrdad did not inform me about the announcement he had read in the newspaper. It was the call for the state exam held by the Iranian Ministry of Health and Medical Education to award PhD scholarships abroad. Thank you Mehrdad for your phone call which magically came just a day before the deadline for exam registration! It was really a tough situation to be prepared for that hard and competitive exam besides the work and ordinary duties of the life. My family gave me the courage to do this and supported along every inch of this journey afterwards. First of all, I would like to thank my mother and father who have always been the first encouraging force throughout my academic life including my PhD study. I am sure that their prayers have been always with me in all success that I have had in my life. I wish my father was still alive and could see his son's recent achievement. I pay my respect to his soul and I believe he is still taking care of me and would celebrate with me. My dearest Safoura, it is extremely difficult to find a proper word to show how thankful I am to you for all your support and devotion from the beginning to the end of this journey. May Allah bless you for all your efforts you have put in our life, and in these four years! My lovely Hosna and Mahdi, you have definitely been my fellow travelers in this journey. Thank you for all beautiful colors you poured on our life which made it incomparably delightful.

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simply got stuck, you excellently guided me just by saying a few words. I always admire your talent of saying few but very valuable words. Thank you for your excellent guidance, and consideration. Dear Milena, I felt your support from the very beginning. Do you remember the first time we met? I had just come in Maastricht and you picked me up from the hotel and walked me around the AZM and FHML. I am not bad at math, but I cannot solve the equation of your working hours' time plus hours you dedicate to your family and yourself within a 24 hour schedule. It has been always my riddle how you can get so many hours out of just one day. Thank you for all your support and consideration!

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Living thousands kilometers far from your homeland always makes you feel alone, even though people of the host country are friendly to you. Our Iranian friends didn't let this happen to us. My dearest friends! Thank you all for all amazing and fabulous times we had together, all day trips, barbecues, high teas, and religious ceremonies. I especially would like to thank Hossein, Shayeste, Mahdi and Shadi, with whom we felt belonging to a bigger family and enjoyed the warmth and closeness of this family.

I would like to close this section with my words of thanks in Persian for my family in Iran.

به روح پاک پدرم درود و سلام می فرستم. و بر دستان و پاهای مادر فداکار و مهربانم بوسه می زنم. از اینکه در دامن پدر و مادری چون شما تربیت شده ام به خودم افتخار می کنم و شکر حضرت باری تعالی را به جا می آورم. از همسرم به خاطر همه همراهیش در همه سالهای زندگی مشترکمان و به خاطر همه صبر و تحمل و خوبیهای بی دریغش در این چهار سال و اندکی تشکر می کنم. همیشه قدردان لطف و مهربانی پدر و مادر همسرم بوده و هستم و صبر و تحملشان در دوری این چند ساله را سپاس می گذارم. از برادر و خواهرهایم و همسرانشان و خواهرها و برادرهای همسرم و همسرانشان که همیشه مرهون لطف و مهربانیشان بوده ام تشکر می کنم. بدون اغراق از داشتن چنین خانواده ای به خود می بالم و خداوند منان را پیوسته شکر می گزارم.

CURRICULUM VITAE

Mohammadreza (Reza) Rezayatmand was born on 11 September 1975 in Esfahan, Iran. Having obtained his medical degree in 2000, he worked as medical doctor for almost 10 years in rural and urban areas in Iran. In parallel, between 2002 and 2010, he has also worked for the provincial office of Iran Health Insurance Organization in his hometown, Esfahan. At the same time, he has been teaching 'health insurance' in BSc program in Isfahan University of Medical science.

In 2008, Reza participated in a highly competitive state exam held by the Ministry of Health and Medical Education of Iran for five PhD scholarships abroad in health economics. He was the only physician who successfully passed the exam and was awarded the scholarship.

Since June 2010, he has been working as a PhD candidate at Maastricht University. The focus of his research is the relationship between health insurance and health-related behavior. In this period, he also completed the Master of Public Health at Maastricht University, specialization Health Policy, Innovation and Management, obtaining his MSc degree in 2011. During his PhD, he has paid attentions to valorization of his results by participating in several European and International conferences in health economics.

Currently, he is an academic member in School of Health Management and Information Science in Isfahan University of Medical Science. His research interest is related to health insurance, value based purchasing and behavioral health economics.

Dissemination of research results

Publications

Rezayatmand, R., M. Pavlova and W. Groot (2013). "The impact of out-of-pocket payments on prevention and health-related lifestyle: a systematic literature review." *The European Journal of Public Health* 23(1): 74-79.

Rezayatmand, R., M. Pavlova and W. Groot (2012). "Health insurance and decision to change health-related lifestyle: a case study for the Netherlands." *the Geneva association health and aging*, No 27, October 2012.

Under review

Rezayatmand, R., M. Pavlova and W. Groot. "Socioeconomic aspects of health-related behaviors and their dynamics: a case study for the Netherlands".

Rezayatmand, R., W. Groot and M. Pavlova. "Smoking behavior and health care costs coverage: a European cross-country comparison"

Rezayatmand, R., M. Pavlova and W. Groot. "Patient payments and unhealthy behavior: a comparison across European countries".

Conference presentations

Rezayatmand, R., M. Pavlova and W. Groot. "Internal medical cost of unhealthy behaviors: A cross country comparison across Europe" *In: 10th World Congress on Health Economics*, Dublin, Ireland, 13-16 July, 2014. (Oral presentation)

Rezayatmand, R., M. Pavlova and W. Groot. "Do smokers use more health care services and pay less? A cross-country comparison across Europe." *In: 4th SHARE user Conference*, Liege, Belgium, 28-29 November, 2013. (Oral presentation)

Rezayatmand, R., M. Pavlova and W. Groot. "Health insurance and health-related lifestyle: A cross-country comparison." *In: 9th World Congress on Health Economics*, Sydney, Australia, 7-10 July, 2013. (Oral presentation)

Rezayatmand, R., M. Pavlova and W. Groot. "Individuals' decision to change health-related lifestyle." *In*: SHARE users' Conference, Venice, Italy, 27-29 June, 2012. (Oral presentation)

Rezayatmand, R., M. Pavlova and W. Groot. "Health insurance and individuals' decision to change health-related lifestyle." *In*: European Conference of Health Economics (ECHE 2012), Zurich, Switzerland, 18-21 July. 2012. (Oral presentation)

Rezayatmand, R., M. Pavlova and W. Groot. "The impact of out-of-pocket payment on prevention and health-related lifestyle". *In*: European Conference of Health Economics (ECHE 2012), Zurich, Switzerland, 18-21 July. 2012. (Poster presentation)

Rezayatmand, R., M. Pavlova and W. Groot. "The impact of out-of-pocket payment on prevention and health-related lifestyle". *In*: Final project conference of ASSPRO: Equity and efficiency effects of out-of-pocket payment in Europe, Vilnius, Lithuania, 2-5 December, 2012. (Oral presentation)