

# **Psychosocial care to cancer patients: does it lead to medical cost offset?**

*A feasibility study in the Netherlands*

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## Summary

This study examines the possibilities in the Netherlands for accomplishing a medical cost offset study regarding psychosocial oncology treatments. The health care costs of two groups of cancer patients are compared in this quasi-experiment; one group receiving psychosocial treatment (cases) and one group not receiving this treatment (controls). The two groups are tried to make comparable by matching on the variables age, gender, type of cancer, moment of cancer diagnosis, comorbidity and past mental clinical record. The data are collected from health care provider *de Vruchtenburg* and Dutch health insurer *Achmea*.

The results of this study showed that psychosocial care to cancer patients does not lead to medical costs offset. With a significance difference (Sig. = 0.000), the cases had more than twice the total health care costs of the control group. The cost differences were significant for most of the different types of care as well. However, this study is confronted with many methodological limitations. Further research is necessary to falsify the medical cost offset hypothesis in psychosocial oncology care.



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## Introduction

Cancer is a major health problem in populations worldwide; it is one of the leading causes of death, particularly in the developing world (WHO 2008a). In the last 30 years the incidence of cancer has doubled as a result of demographic (aging of the population) and lifestyle factors (smoking and drinking) (BBC 2005). Cancer was the cause of death of 7.6 million people in 2005 (WHO 2008a). The diagnosis of such a life threatening disease can cause physical and mental complaints. Mostly these complaints disappear after some time. In some cases the diagnosis of cancer causes lasting mental problems, like adjustment disorders, posttraumatic stress disorders or distress (De Haes et al. 2005). Moreover, external changes of the body, like breast amputation and hair loss, can influence a person's mental health. Several studies examined the prevalence of psychosocial distress among cancer patients. Generally, the level of distress is mostly ascertained in the 35% - 45% range of all cancer patients (Zabora et al. 1997 & Zabora et al. 2001). Psychosocial interventions are provided to help cancer patients with their social, emotional and psychological problems.

In the Netherlands, different organisations provide psychosocial treatment to people with cancer. These organisations are united into IPSO (Foundations for Psychosocial Oncology). The foundation the *Vruchtenburg* is established to support persons with cancer and their fellows in Rotterdam (*Vruchtenburg 2007*). The *Vruchtenburg* provides psychosocial treatment in several forms, like mental support sessions, creative therapy, haptotherapy, relax days and several courses like 'stress reduction', 'continuing after cancer' and 'cancer in perspective'. Organisations like the *Vruchtenburg* have to contend with financial budget problems every year, probably because of the doubtful cost-effectiveness of these psychosocial treatments. These financial problems are a major reason to do this study; if psychosocial treatments reduce other health care costs, funding could be much easier.

There are different techniques to conceptualize the benefits and costs of interventions, like cost-minimization analysis, cost-effectiveness analysis, cost-utility analysis and cost-benefit analysis. A 'new' concept to measure economic benefits of interventions is medical cost offset 'which refers to the situation where as a result of an intervention or an improvement in effectiveness of an intervention, usual costs to the health care system may be reduced or averted' (Carlson & Bultz 2004). This study examines whether psychosocial interventions to cancer patients leads to medical cost offset. There is inquired whether the total health care costs of cancer patients receiving a psychosocial treatment are lower than the total health care costs of cancer patients not receiving a psychosocial treatment. This could be the case if, for example, as a result of the psychosocial treatment other care

utilization, like medicines (e.g. sleeping drugs) or the number of visits to the general practitioner, is reduced or averted.

The first chapter of this study deepens into the background of psychosocial care in the specialism oncology. The second chapter describes the methodology of this study, followed by the results in the third chapter. In the last chapter, the study is critically reflected in the discussion and concluding observations are deduced.

## Background

Health is a very important item in the lives of human beings. Persons try to maintain their health in several ways; one way is to consult health care providers. When persons are confronted with the disease cancer, utilization of psychosocial treatment can be a result to counteract arisen physical and mental complaints from this disease. This study is directed at this utilization of psychosocial treatments by cancer patients. The need and demand for psychosocial treatment differs between persons. Several factors can play a role in the decision whether or not to consult psychosocial care providers. The most important factor determining the use of psychosocial treatment is the mental health status of a person. Different cancer related factors, like the type of cancer, the stage of the disease, the type of treatment, the physical complaints after the treatment, the existence of depressive symptoms prior to diagnosis and the degree of satisfaction with the support of the doctor and the family, influence the mental health status and the presence of psychological disorders (Oncoline 2008 & Bottomly 1997). An example of differences in presence of mental disorders among type of cancer is the fact that gynaecological cancer patients often experience more feelings of social isolation compared to patients of other types of cancer. They find it more difficult to discuss their cancer as well, what contributes to anxiety (Bottomley 1997). Depressions, anxiety neurosis and suicide appear more often with cancer patients with cancer in the head-neck area in comparison with other types of cancer (Henderson 1997).

Besides, the different stages in the disease trajectory are related with different levels of emotional distress. Before the decisive diagnosis, there is a period of tension (Rogers & Woolgar, 1999). The period after the diagnosis is mostly experienced stressful because of learning to deal with the diagnosis and making choices about the treatment at the same time. During the diagnosis and the treatment feelings of fear and uncertainty arise about the progress of the disease and the treatment (Landius et al. 1994). After the treatment two emotions are dominant: relief and fear for return of the disease. People also have to deal with the health problems and physical constraints resulting from the treatment. In some cases the cancer returns after a few years. Depression has been found the most with cancer patients when the first recurrence is ascertained. Next to that, in case of metastases anxiety, depression and traumatic stress symptoms significantly arise (Classen et al. 2001). The surviving chances have consequences for the mental health status too. When the patient becomes in the palliative stage of the disease, physical symptoms and pain increase, what also may result in mental illness of cancer patients (Toth-van den Berg 2001). Because of these different stages in the disease progress and the associated emotions, the demand for



psychosocial support differs; some cancer patients consult a psychosocial care provider directly after the diagnosis, others many years after completing the cancer treatment.

Moreover, the type of treatment has consequences for the mental health status. Surgery, for example, results in more anxiety and fear than radiation therapy. The site of surgery is important too; mastectomy outweighs the surgery for malignant melanoma in terms of psychological consequences. 'Patients who undergo mastectomy report sexual problems, body image concerns, low self-esteem, lack of femininity, anxiety, and depression' (Bottomley 1997). Chemotherapy has side-effects which upset cancer patients. The incidence of psychiatric problems in case of chemotherapy ranges from 5 to 26%. Some components of the chemotherapeutic treatment (mostly used in neurologic types of cancer) can cause increased depressions. 'As cancer patients tend to be older, they are more disposed to cognitive impairment caused by age and any additional effects of chemotherapy' (Bottomley 1997). Physical disabilities as a result of the treatment lead to more mental problems.

At last, the existence of depressive symptoms prior to the cancer diagnosis is a determinant for psychological disorders. The risk of anxiety and depression for patients increases significantly when they have a medical history with depressions (Maunsell et al. 1992).

The demand for psychosocial treatments by cancer patients is dependent on different factors. As described, the type of cancer and the treatment is important, as much as the stage of the disease. Besides to these health status related factors, some patient characteristics can play a role, like age, gender and socio economic status (Van der Maas & Mackenbach 1999).

### The effectiveness of psychosocial care

In the passing years, several studies have focused on the effects of psychosocial treatment for persons with cancer. Part of these studies was aimed at the treatment effects on the survival of cancer patients, others at the effects on quality of life of these patients. The effects of psychosocial treatment on the survival of cancer patients are not clear. Some studies find there is no effect on survival (Spiegel et al. 1989). Other researchers find significant effects but place limitation on the consistency, validity and reliability of the measurements (Spiegel et al. 1998 & Falagas et al. 2007).

The effects of psychosocial interventions on quality of life are more promising. Psychosocial interventions are concluded to be efficacious in improving quality of life in most of the reviews (Meyer & Mark 1995, Blake-Mortimer et al. 1999 & Fawzy 1999). However, the

methodology of these studies is debatable (Newell et al. 2002). According to Newell and colleagues the effectiveness of the psychosocial interventions on quality of life can not be assessed in many reviews because of lacking methodological rigor.

There are different forms of psychosocial interventions; mostly a distinction is made between psycho-education, cognitive behavioral training, group supportive therapy and individual supportive therapy. These different types of interventions are variously effective during the disease trajectory. For example, in the diagnosis / pre-treatment stage, when the patient's need for information is the highest, psycho-education is most effective. Group supportive therapy is most effective in later stages (Blake-Mortimer et al. 1999).

Historically, most of the effectiveness studies have focused on breast cancer patients as patient group (Carlson & Bultz 2004). Now other patient groups are increasingly studied, like head and neck cancer patients (Vakhari et al. 2007 & Hammerlid et al. 1999). Group therapy is the form of psychosocial intervention commonly examined. Group therapy is concluded to be in advantage compared to individual therapies because of three reasons. Social support is the first reason; interaction and being part of the group counteracts a patient's experienced social isolation after the cancer diagnosis. The second reason is the helper-therapy principle which refers to the fact that a patient is a helper to other group-members besides being a patient him- or herself. The last advantage is the cost-effectiveness: group-therapy is much cheaper compared to individual therapy (Spiegel et al. 1999).

In summary, there is much literature entering into the effectiveness of psychosocial interventions. In the large majority of the studies the interventions decrease the level of distress and improve the quality of life of cancer patients (Carlson & Bultz 2004). Furthermore, the best way of providing care according to Sobel (1999), is a manner in which health and quality of life is improved simultaneously with controlling health care costs. Ignoring the psychosocial health of cancer patients can lead to ineffectiveness, frustration and a waste of health care resources (Sobel 1999). The next paragraph deepens into the subject of psychosocial health care costs more thoroughly.

#### Cost-effectiveness and medical cost offset of psychosocial interventions

'There is emerging evidence that empowering patients and addressing their psychosocial needs can be health and cost effective. By helping patients manage not just their disease but also common underlying needs for psychosocial support, coping skills, and sense of control, health outcomes can be significantly improved in a cost-effective manner' (Sobel 1999). In this quotation the term 'health effective' refers to an increase in a person's quality of life as a result of psychosocial treatment. Besides increasing the quality of a

person's life in a cost-effective manner, a reduction in medical utilization can be a consequence of addressing a person's psychosocial health needs as well (Schlesinger et al 1983). The additional costs of these psychosocial treatments can even be offset by the savings from the decreased utilization of other medical care: 'medical cost offset' (Von Korff et al 1990 & Pallak et al 1995).

In the general area of mental illnesses, evidence indicates that psychological treatments lead to significant medical cost offsets. Most of the cost offset studies are accomplished in Managed Care Companies and Health Maintenance Organizations in the USA. These studies point to the fact that costs as well as the frequency of hospitalization and number of visits to emergency room and physician decrease as a result of psychotherapy (Carlson & Bultz 2004). A study in Hawaii focused on high users of care which were randomly assigned to a mental health treatment emphasized on rapid decrease of distress or to usual care. During 18 months the costs were measured which showed a 44 % difference in medical costs between the groups. Within six months, the intervention costs were offset (Pallak et al. 1994).

A meta-analysis applied to 91 studies examining medical cost offset estimated an average saving of 20% resulting from psychological interventions affecting the utilization of medical care by medical populations (Chiles et al. 1999). Besides this study, there are many other studies with medical cost offset as subject. The evidence of these studies give the same sound: when psychosocial care is provided to medical patients, the burden to the health care system is reduced, resulting in economic benefits (Carlson & Bultz 2004).

Von Korff et al. (1998) found an opposing result: the medical costs of distressed outpatients increased after consulting a mental intervention. And also the results of the study of Levenson et al. (1992) show that psychiatric intervention did not reduce the costs of young medical inpatients suffering from psychological distress.

There are not many medical cost offset studies exclusively aimed at psychosocial care to cancer patients. There is a Canadian study which randomly assigned breast cancer patients to a psychosocial treatment or a control condition in order to measure differences in health status as well as costs. Health statuses as well as invoiced costs were prospectively followed-up during a period of two years. Women receiving the psychosocial intervention billed 23,5 % less costs than the control group. Note that the participants of this study were not experiencing distress before the study began, this makes the results more significant (Simpson et al. 2001 & Carlson & Bultz 2004). Besides this study, there are a few studies examining the utilization of health care by cancer patients (not in particular the costs of this utilization). Evidence shows that patients with psychosocial problems have higher health care

utilization rates than patients without these problems and psychosocial treatment leads to reduced health care utilization (Rosenberg et al. 2002 & Ashbury et al. 1998).

The concepts 'medical costs offset' is not blame free. Sturm (2001) critic the concept of medical costs offset for two reasons. At first, medical cost offset may not be an argument for covering mental health treatments by insurance. 'There is little point in spending money on something that is cheap if it provides no benefits'. The (cost-) effectiveness should be important. Second, there is no evidence that mental health treatments leads to medical costs offset. The existing evidence is based on specific groups and may not be generalized to whole populations. According to Sturm, mental health treatments do not lead to cost offset but to cost shifting: people visit the mental health provider instead of other providers (Sturm 2001).

Exclusively medical cost offset should not be a reason for covering psychosocial treatment by insurance. Yet, in case of proven effectiveness of psychosocial oncology treatments, the fact these treatment probably leads to medical cost offset would be a great addition. The previous studies do not unambiguously indicate that psychosocial treatments lead to medical cost offset. However, none of these studies are performed in the Dutch health care setting. The results are therefore not right away to generalize to the Netherlands. Based on the findings of some of the mentioned studies there is assumed that psychosocial care will reduce the health care utilization and therefore also the total health care costs of cancer patients. This study tries to examine the possibilities for doing a medical cost offset study in the Netherlands. A Randomized Controlled Trial would be the best way to perform this study but this methodology is not possible due to the short time period. Therefore a quasi-experiment is performed in which already available data are used and the facing possibilities and limitations are presented. The next chapter deepens into the methodology of this study.

## Methodology

This study examines the possibilities for testing whether psychosocial interventions to cancer patients lead to medical cost offset. This study is a quasi-experiment based on retrospective data. Clients of foundation *de Vruchtenburg* are the starting research group of this study. These clients are cancer patients receiving a psychosocial treatment and are therefore the 'cases' of this study. The first requisite for these clients is that they are insured with insurance company *Achmea*. This is necessary because of finding a 'control' group: cancer patients not receiving a psychosocial treatment. The declared health care costs of these two groups will be compared. This comparison is only based on direct health care costs; work-related costs, not declared transportation costs and time costs of the patient are not included in the study.

This methodology chapter starts with an action plan. This plan is based on the existed expectations, assumptions and choices before the data collection started. The second part of this chapter contains real the progression of this study. These two parts are not the same because some aspects differed from what was expected.

### Methodological action plan

As said, this study starts at the *Vruchtenburg*. All clients from the beginning of this foundation (2003) will be collected with the requirement that they are insured with insurance company *Achmea*. At this point a selection problem arises: which persons are in the databases of *de Vruchtenburg*? Which persons are of opinion that they need psychosocial oncology care? A referral by the general practitioner is required to be eligible for a psychosocial treatment. Which people are referred and use psychosocial treatment and which person are not referred or do not act upon to this referral? This selection problem can not be changed and is inevitable in case of a quasi-experiment.

If all *Achmea* insured clients of *de Vruchtenburg* are collected, the cost data of these cases and a 'control' group can be requested with *Achmea*. For this control group all insured who have cancer will be collected, with the help of Diagnosis Treatment Combination codes (in Dutch abbreviated as DBCs). Out of this population, a group will be composed which matches the cases. Matching is necessary to make the two groups as comparable as possible. The before mentioned selection problem of differences in choice to use psychosocial care, can not be redressed. The two groups will be matched on the following criteria: age, gender, type of cancer, moment of diagnosis, comorbidity, past mental clinical record and region in which the person is living. The variables age, gender, comorbidity and region rely on the Dutch risk equalization system in which health insurers are compensated

for insuring persons who are identified as being more expensive in advance on the basis of these (and more) variables. Data of all matching criteria are expected to be included in the *Achmea* databases or the possibility to withdraw these criteria from these databases.

At first, there will be matched on the criterion age. In general, elderly people have higher health care costs than younger persons. Comparing a 25-year old with a 70-year old would not be suitable. Likewise, costs can differ between men and women as well as between persons with different types of cancer (and the different treatments associated with that). Comparing a man with a woman would not be correct and neither would it be correct to compare a breast cancer patient with a bowel cancer patient. Therefore gender and type of cancer are included as matching criteria as well. The moment of diagnosis is an important matching criterion to be able to compare the cost development over time. Assumed is the fact that health care costs increase after the cancer diagnosis. Since total costs in this study will be a summation of costs of three years (2005 till 2007), it would not be accurate to compare the health care costs of someone with the cancer diagnosis in May 2005 with someone with the cancer diagnosis in December 2007. Matching on comorbidity is important because the different comorbidity conditions can cause high extra expenses. In case of matching on comorbidity conditions, differences in costs between cases and controls which are related with this comorbidity condition, instead of cancer or health care utilization behaviour, can be avoided. The criterion 'psychopharmaca utilization before 2005' is used as a proxy for the mental health status prior to cancer diagnosis. Persons with a worse mental health status prior to cancer diagnosis are matched with persons with an equal mental health status in order to avoid inequality in health care utilization behaviour resulting from differences in historical mental health status. At last, region will be included as a matching criterion for three reasons. At first, living in certain regions in the Netherlands (backwardness regions) is associated with a certain socio economic status. The health status and health care utilization behaviour is related with this socio economic status (Van Oers 2006). Matching on region (used as proxy for socio economic status) should correct for these differences in costs. Second, evidence indicates that there are differences in health care utilization between regions (RVZ 2004). Matching on region should correct for these differences as well. And third, prices of certain types of care can differ considerably among regions. The price for a certain treatment in hospital A can differ half the price of the same treatment in hospital B (Bassant 2005). Practitioners of physiotherapy and psychotherapy are permitted to set their own prices as well, what results in considerable differences between regions. General practitioners are tied to maximum prices (NZa 2008).

All matching controls will be included in the research sample, even when more than one match appears for a certain case. Controls declaring psychosocial treatments elsewhere will be deleted: these controls are not feasible in this study. If not any control appears for a

certain case, the matching criteria will be drifted: age and moment diagnosis will be expanded. If not any comparable control appears at all, the case will be deleted. *Achmea* will be requested to deliver all cost data of the controls as well.

The next step will be preparing the data for the analyses. The health care costs will be divided in costs per quarter of the year and costs per type of care. The following types of care will be distinguished: general practitioner costs, medication costs, hospital costs, alternative healing methods, paramedical care, transport, mental health costs and aids and equipment. All dental care costs will be removed, because these costs are thought not to be relevant in this study. At last the analyses will be performed in the statistical program SPSS. The costs are probably not normally distributed and therefore the costs will be transformed in logarithmic costs in order to be able to use the T-test for groups in the analyses. There will be examined whether there are differences in total health care costs (during the whole period), differences in costs per quarter of the year en differences in costs per type of care. Sensitivity analyses will be performed to test whether including the 'imperfect' matches has had a significant influence on the results. Breast cancer is expected to be the major type of cancer in the research sample. A sensitivity analysis will therefore be performed to test the influence of this type of cancer on the results. As well, the effect of the costs of the psychosocial treatment on the results will be examined.

### Progression of the study

During the implementation of this study, some limitations arose and further choices had to be made. Therefore, at some points the real progression of this study turned out differently from what was expected in the above mentioned plan of this study.

### *Data collection*

The required data are collected in three stages. In the first stage, all clients of the *Vruchtenburg* with an insurance contract with *Achmea* were selected. Clients were retrospectively collected back till 2003, which is the year of the beginning of foundation the *Vruchtenburg*. As a result of this selection, 211 clients of the total of 1308 clients were taken to the second stage of the data collection. From these 211 cases some regular data was collected for every client, like gender, age and type of cancer (if known). Besides, the costs of the psychosocial treatment of these clients were assessed.

In the second stage, the clients of the *Vruchtenburg* were searched in the databases of *Achmea*. In the database of *Achmea* a few difficulties arose. At first, 25 cases were not findable in the database so the number of cases reduced to 186. Second, a few people

switched health insurer after 2006 resulting in missing data for the last years. These cases (28) were also deleted. The third difficulty concerned the type of cancer and the moment of cancer diagnosis. These variables are the primary matching variables and for another few cases (7) these variables were missing. Related to this problem is the fourth problem, which also concerned the diagnosis of the cancer patients. In the Netherlands, the exact diagnoses can only be revealed since 2005 because of the change in payment system that year. In 2005 the hospital payment system with DBCs (the Dutch abbreviation of Diagnosis Treatment Combinations codes) was implemented. From these codes the exact diagnosis can be derived. Before this period, health insurers had only data about treatments (e.g. visits to the general practitioner and chemotherapies) and not about the diagnosis of these patients. This causes problems in matching cases with controls in the years before 2005. The type of cancer is a very important aspect in matching a case with a control and these cancer types are not identifiable for the controls before 2005. As a result of this, all cases with the cancer diagnosis and their first contact with the *Vruchtenburg* before 2005 were deleted. The number of cases is now declined till 104. A fifth reduction in number of cases was a consequence of a choice which is made. To be able to observe long-term cost effects of the psychosocial treatment, cases had to have the psychosocial treatment completed in or earlier than the year 2007. Cases who did not finish their psychosocial treatment before 2008 were therefore deleted (34 cases). Another choice that was made concerned the disease process of the cases. Some cases visit the *Vruchtenburg* immediately when they hear they have cancer, while others visit the *Vruchtenburg* in case of dissemination or returned cancer. Therefore, the moment of cancer diagnosis was assessed at the diagnosis moment that led to the choice to contact the *Vruchtenburg*; for some cases this was the first disease episode, for others it was the second or the third. This choice can be defended by the fact that we can not reveal the disease history of the controls either (since information about diagnoses is only available since 2005). The fact that the moment of diagnosis is the first, second or third disease episode is unknown among the cases as well as among the controls. This is a problem which can not be redressed with the existing data. The definitive group of cases consists of 70 persons. For all these persons their health care utilization and the associated costs were traced in the data of *Achmea*. These costs were detailed in time, type of health care provider and type of care provided / treatment.

In the third stage, a control group was composed out of the databases of *Achmea* on the basis of DBC codes. In these DBC codes a code for the diagnosis is taken in. All diagnosis-codes referring to a particular type of cancer that correspond to a type of cancer of one of the cases were located. All insured declaring one of these particular diagnosis codes were gathered. For all these persons data was collected identical to the data of the cases.



One selection is made while searching for control candidates. The health care system has reformed in 2006. Before 2006 there was a distinction in mode of insuring between people with an income above a certain level and beyond that level. The manner of administration at the health insurance company also differs between these two groups. The Sickness Insurance Fund insured (the lower incomes) were administrated in a much clearer and more accessible mode than the private individual insured. For the private individual insured data was hardly findable about the costs and if these data was available, the kind of cost it concerned was not traceable (hospital, general practitioner etcetera). Control candidates were therefore only selected out of the Sickness Insurance Fund database.

Ultimately an Excel database consisting of 135.358 persons who are treated for one of the cancer types was provided. The database was a declaration document, with one record for every health care declaration a patient or a health care provider has done. Out of this database controls are selected matching certain characteristics of the cases.

#### *Data preparation*

After the data collection process, the data are prepared and transformed for two objectives: 1) to match the cases to the controls and 2) for analyzing the data. All data operations will be done with the statistic program SPSS; the collected files are read into a SPSS file first. As said, the database contains one record for every health care declaration. These declarations are labelled with variables as declaration date, element of care, type of care and price. When a declaration contained a DBC code or an Anatomical Therapeutic Chemical (ATC) code (which reflects a certain pharmaceutical product), these codes were also mentioned. These labelling variables are used for the data preparations and transformations.

The matching process is based on the criteria gender, age, type of cancer, moment of cancer diagnosis, comorbidity and mental problems (utilization of psychopharmaca) prior to the cancer diagnosis. Most of these variables had to be calculated, abstracted or transformed from variables included in the database. Only the variables gender was listed in the original database and did not need any further transformations. Age is calculated from the date of birth, which was an included variable. To identify the type of cancer a person is suffering from, DBC codes are used. All records containing a DBC code were filtered out first. A DBC code consists of 14 figures referring to the following elements: the first two figures reflect the specialism of care, the following two figures reflect the type of care (regular or continuation) followed by two figures defining the care request. The next four figures tell the diagnosis and the last four describe the treatment for this diagnosis. The specialism

codes and the diagnosis codes were filtered out of the DBC-code. The combination of these codes reflects the type of cancer the person is suffering from. The date of opening of the first cancer-related DBC-code is used as the moment of diagnosis of the cancer.

Next, comorbidity is defined with help of the utilization of certain drugs. When the declaration made by a person concerned a pharmaceutical product (drugs) the Anatomical Therapeutic Chemical code of this drug was added in the original dataset from *Achmea*. This ATC code reflects the groups in which the drugs are divided according to the organ (or system) they act on and their pharmacological, chemical and therapeutic properties. All drugs are divided into groups in the ATC classification system in order to attend to drug utilization research (WHO 2008b). The types of comorbidity that could appear are equal to the Pharmaceutical Costs Groups (in Dutch abbreviated as FKG) used in the Dutch risk equalisation system. There are twenty FKGs to which certain ATC codes are allocated. When a person declared pharmaceuticals with an ATC code belonging to a certain FKG, the person is assigned to that comorbidity condition. The different comorbidity conditions that could appear are diabetes type I and type II, rheumatoid arthritis, Crohn's disease, cystic fibrosis, kidney affections, hypertension, heart affections, high cholesterol, mental diseases, cancer, HIV/ AIDS, glaucoma, growth hormones, thyroid gland affections, Parkinson's disease, transplantations, epilepsy, chronic specific respiratory affliction and neuromuscular affections.

The last matching criterion is the existence of mental problems prior to the cancer diagnosis. The diagnosis of cancer was assessed in or later than 2005 for every person in the research sample. The existence of mental problems prior to the cancer diagnosis is therefore the same as the existence of mental problems before 2005. The utilization of psychopharmaca is used as a proxy for these mental problems. Three different groups in the use of psychopharmaca were distinguished: 1) antipsychotics, 2) anxiolytics, hypnotics and sedatives and 3) antidepressants. Again the ATC-codes of the drugs are used to identify the utilization of these psychopharmaca drugs. Although, for many persons the data before 2005 was missing. Therefore the existence of mental problems before 2005 was not to assess for everybody. If data was missing, the assumption is made that this person had no mental health problems prior to cancer diagnosis. This may be a wrong assumption, but because of lacking data unfortunately inevitable.

Beside preparing the data for the matching process, the database is also prepared for doing the analyses. Existing variables are used to compute new variables like costs per type of care and costs per quarter of the year. The variables 'elements of care' and 'type of care' were used to label each declaration to a type of care. For example, costs of services of the general practitioner were assigned to the variable 'general practitioner costs' and services in

the hospital were assigned to the variable 'hospital costs' etc. The following types of care were distinguished: general practitioner, medication, hospital, alternative healing methods, paramedical care, transport, mental health care and aids and equipment. All dental care costs were removed, because these costs are thought not to be relevant in this study. Furthermore costs not associated with services were excluded, like the extra costs a general practitioner is receiving for treating elderly people and extra costs for treating people living in backward areas in the Netherlands. These costs would make elderly people and poorer people more expensive, even without consulting the physician.

Besides grouping the costs to type of care, a person's health care cost are grouped per quarter of the year. Upon every declaration the starting and finishing date was mentioned. The starting date is used as the date whereupon the declaration started. The declarations are assigned to the quarter in the year in which the starting date belongs. When costs were scattered over more than one quarter of a year (the finishing date was in another quarter of the year), costs were included in the quarter in which the treatment started.

After computing these new variables, the database was aggregated. The databases consisted of many records per patient before and now the database is changed in one line per patient, with costs summed up per quarter of the year, per type of care and variables revealing characteristics of the persons like gender, age, type of cancer, moment of diagnosis, comorbidity conditions and utilization of psychopharmaca.

### *Matching*

Since the database is prepared for the matching process, there is searched for cases and controls with equal characteristics. As said, these characteristics are gender, age, type of cancer, moment of cancer diagnosis, comorbidity and mental problems prior to the cancer diagnosis (utilization of psychopharmaca before 2005). The plan of action records region as a matching criteria as well. Though, this criterion is not used in the matching process; including this matching criterion would have resulted in zero matches between cases and controls.

First, the cases and the controls were matched on gender, age, type of cancer and the moment of diagnosis (detailed to the same month). For some cases there were no controls that had exactly the same characteristics. For these cases, age and the moment of diagnosis are expanded till matches appeared. The limit of the year of birth was five years above or five years below the year of birth of the case. The moment of diagnosis had to be in the same quarter of the year as the diagnosis of the case. The moments of diagnosis could therefore differ at maximum two months with the moment of diagnosis of the case.

After matching on age, gender, type of cancer and moment of cancer diagnosis, the cases were also matched to the controls on the criteria 'comorbidity' and 'utilization of psychopharmaca prior to cancer diagnosis' (utilization of psychopharmaca). For 24 cases there were no matches found. In order to find matches and avoid removal of these cases, the number of comorbidity conditions was counted and number of comorbidity conditions became a matching criterion instead of type of comorbidity. These matches were labelled as imperfect matches. For two cases, there were no matches at all. These cases were removed. Three controls are deleted, because they declared psychosocial health care costs while they were no cases. The definitive database consisted of 68 cases and 277 controls (some cases had more than one control). The tables 1, 2, 3 and 4 show some general characteristics of the research sample.

The demographics are different from the total database provided by *Achmea*. From these 135.358 persons suffering cancer 35,6 % persons are male and 64,4 % female. The mean age was 60,3. The prominent cancer type is skin cancer (in different forms, including melanoma and malignant birthmarks) with a percentage of 43,9 %, followed by breast cancer with 29,3 %. 4,4 % of the persons suffers lung cancer, 3,4 % bowel cancer and 6,6 % head and neck cancer. These percentages differ from the research sample.

	<i>Cases</i>		<i>Controls</i>		<i>Total research sample</i>	
Number of men	4	5,9 %	16	5,8 %	20	5,8 %
Number of women	64	94,1 %	261	94,2 %	325	94,2 %
Mean age	53		54		53,6	

Table 1 Demographics of the research sample

	<i>Cases</i>		<i>Controls</i>		<i>Total research sample</i>	
Breast cancer	40	57,4 %	187	67,5 %	227	65,7 %
Lung cancer	2	2,9 %	5	1,8 %	7	2,0 %
Bowel cancer	6	8,8 %	22	7,9 %	28	8,1 %
Skin cancer	5	7,4 %	14	5,1 %	19	5,5 %
Head and neck cancer	3	4,4 %	16	5,8 %	19	5,5 %
Ovary cancer	3	4,4 %	4	1,4 %	7	2,0 %
Cervical cancer	3	4,4 %	7	2,5 %	10	2,9 %
Vulva cancer	1	1,5 %	4	1,4 %	5	1,4 %
Endometrium cancer	1	1,5 %	7	2,5 %	8	2,3 %
Hodgkin	1	1,5 %	2	0,7 %	3	0,9 %
Cancer of the plasma cells	2	2,9 %	2	0,7 %	4	1,2 %
Bladder cancer	1	1,5 %	7	2,5 %	8	2,3 %
Total	68	100 %	277	100 %	345	100 %

Table 2 Appearing cancer types in the research sample

<i>Comorbidity Condition</i>	<i>Frequency cases</i>	<i>Frequency controls</i>	<i>Frequency total research sample</i>
Diabetes Type I	1	1	2
Diabetes Type II	5	7	12
Rheumatoid arthritis	0	0	0
Crohn's disease	1	3	4
Hypertension	18	42	60
Heart affection	5	14	19
Kidney affection	4	4	8
Chronic specific respiratory affliction	11	31	42
Thyroid gland affection	5	9	14
Transplantations	1	0	1
HIV / AIDS	0	0	0
Growth hormones	0	0	0
Neuromuscular affection	0	1	1
Cancer	8	17	25
Mental diseases	19	31	50
Epilepsy	3	2	5
Parkinson's disease	0	0	0
Glaucoma	0	1	1
Cystic fibrosis	0	0	0
High cholesterol	6	18	24

Table 3 Appearing comorbidity conditions

	Cases	Controls	Research sample
Utilization of antipsychotics before 2005	0	0	0
Utilization of antidepressants before 2005	9	9	18
Utilization of anxiolytics, hypnotics and sedatives before 2005	19	29	48

Table 4 Utilization of psychopharmaca in the research sample

For 163 controls, cost data was missing for the year 2005, probably because these persons had been insured with another insurance company before 2006. This missing cost data results in relatively lower total health care costs, because the total is not summed over the period January 2005 to June 2008, but from January 2006 to June 2008. The cancer is diagnosed later than 2005 with all of these persons (otherwise they could not have been a match with a control since moment of diagnosis was a matching criterion). To make the persons comparable and fill in the gaps in the database, the costs for 2005 were imputed. The imputation technique is performed for every quarter of the year 2005 by matching these

persons with persons with equal comorbidity conditions out of the original dataset (N = 135.358). Mean and median costs were calculated and standard deviations were assessed. Because extremes appeared in the database which had high effects on the means, the median costs per quarter of the year are taken instead of the mean costs. Differences between mean and median costs could get 9600 euro's. The gaps in the database were filled with these median costs for the different matches. This imputation technique is performed for time reasons, despite the fact that this technique can lead to troubled estimates and disturbed distribution (Huisman 2006). After this imputation technique, the total costs were recalculated.

### Data analyses

The data analyses are the last part of the methodology of this study. First, there is assessed whether the total health care costs of the research sample is normally distributed. This is not the case (see figure 1). Therefore all the costs variables are transformed in logarithmic costs. The total logarithmic costs are more or less normally distributed (see figure 2).

Second, in SPSS the T-test for groups is accomplished to determine whether there are significant differences in total health care costs between the cases and the controls. The significance level is set on 0.05 %. The total health care costs were the declared costs during the period January 2005 till June 2008. Besides differences in total costs, differences in general practitioner costs, medication costs, hospital costs, costs related to alternative healing methods, paramedical care costs, transportation costs, mental health care costs and the costs of aids and equipment are determined. Finally, T-Tests are preceded for the costs

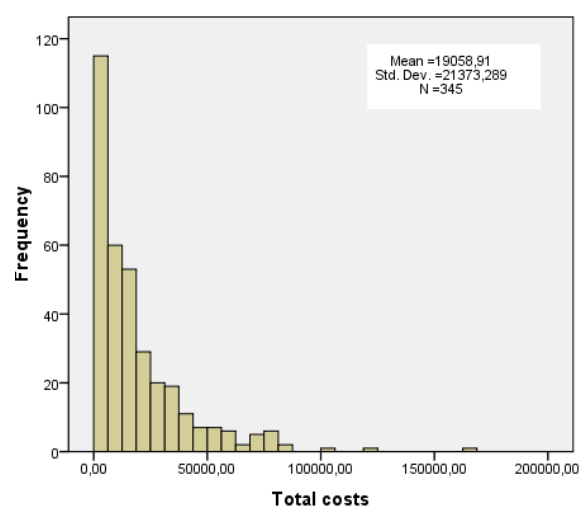


Figure 1 The distribution of total health care costs

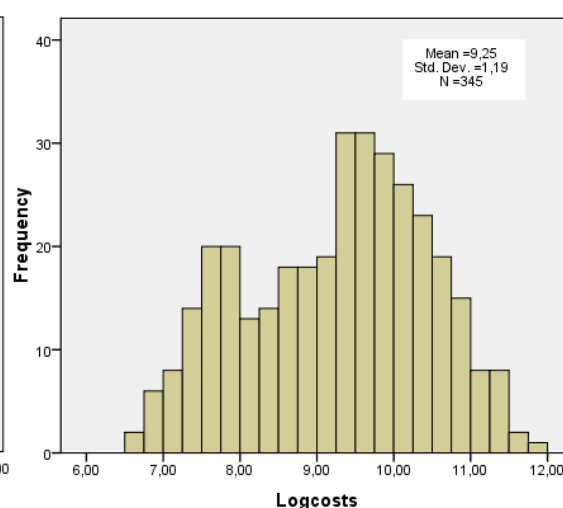


Figure 2 The distribution of the log-transformed health care costs

per quarter of the year to see if moment in time influences the results. An ANOVA test is performed in order to find out whether the moment of diagnosis affects the results.

After including the whole research sample in the analyses, sensitivity analyses are done to test whether including certain sub-groups in the research sample influences the results. Therefore, parts of the sample are excluded from the T-test analyses. Excluded groups were the imperfect matches (24), the extreme cases (6), the non-breast cancer patients (28), the matches with imputed data for the year 2005 (22) and the cases who had less than three psychosocial consults (10).

As said, cases were imperfect when the comorbidity was matched on number of comorbidity conditions instead of type of comorbidity conditions. Besides that, cases could be labelled as extreme cases. Cases belonging to the 10% with the highest health care costs were called extremes; the extremes declared health care cost higher than 75.000 euro during the period January 2005 till June 2008. The associated controls were then also labelled as extremes (also when they were no extremes themselves). A T-test is executed for only the non-extremes. As well, the analyses are repeated for exclusively the breast cancer patients, which is the major type of cancer in the research population. The heterogeneity of the research sample can influence the results, therefore the other types of cancer are excluded in order to tighten the picture. Also the analyses are repeated for only the matches of whom the data was complete; the controls for which the data was imputed were deleted. Another analysis concerned the cases and their matching controls who had at least three psychosocial consults. This minimum number of psychosocial consults is based on the assumption that you can not expect cost offset effects from a psychosocial treatment that only lasted two consults. Literature about the minimum number of psychosocial consults for the treatment to be (cost-) effective is lacking, so this assumption is not supported by any evidence.

At last, an analysis is done in order to determine the effect of the costs of the psychosocial treatment on the results. This is done by subtracting the costs of the psychosocial treatment from the total health care costs and then repeating the t-test to determine whether these costs influence the results.

## Results

Significant differences in health care costs have been found between persons receiving a psychosocial treatment and persons not receiving this treatment. However, contrary to the hypothesis, the cases have significant higher health care costs than the controls (Sig. = 0.000). The mean total health care costs of the cases are more than twice times higher than the mean total costs of the controls. Table 5 shows statistics of the total costs of the research sample. The log-transformed costs are used in the analyses, but the tables show the real (untransformed) health care costs. The amounts in all tables are expressed in Euro's.

Likewise, the differences in costs for the different types of care are analyzed. Table 6 shows the mean costs for the different types of care. The differences in costs between the cases and the controls were significant for all types of care except from alternative care. Though, there are not many persons in the research sample who use alternative care.

Remarkable is the fact that almost everyone uses general practitioner care, hospital care and pharmaceutical care, but paramedical care, alternative care, aids and equipment and transportation is used only by parts of the population (table 7). The percentages in this table indicate that not only the cases have higher health care costs, but use more types of care as well.

	<i>N</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Sig. (2-tailed)</i>
Cases	68	39651,43	28428,50	0,000
Controls	277	14003,71	15590,19	

Table 5 Costs statistics of the total research sample

	<i>Cases (N = 68)</i>		<i>Controls (N = 277)</i>		<i>Sig. 2-tailed</i>
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	
General practitioner	459,14	366,34	207,21	310,89	0,000
Hospital	30064,35	27144,75	10450,24	12991,26	0,000
Pharmaceuticals	4570,84	4989,51	2046,33	3346,68	0,000
Paramedical care	1331,02	1937,46	377,79	811,51	0,017
Alternative care	166,99	474,86	58,51	201,20	0,062
Aids and equipment	594,21	998,36	278,90	699,28	0,005
Transport	377,40	979,35	207,21	650,26	0,049

Table 6 Costs per type of care (total research sample)



	<b>Cases</b>		<b>Controls</b>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
General practitioner	68	100,0	277	100,0
Hospital	68	100,0	277	100,0
Pharmaceuticals	68	100,0	264	95,3
Paramedical care	48	70,6	128	46,2
Alternative care	17	25,0	46	16,6
Aids and equipment	48	70,6	154	55,6
Transport	25	36,8	61	22,0

Table 7 Number and percentages of cases and controls using the different types of care

	<b>Cases</b>		<b>Controls</b>		<i>Sig. (2-tailed)</i>
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	
January – March 2005	1368,00	383,56	530,88	106,15	0,015
April – June 2005	2319,94	6215,92	428,24	1187,17	0,010
July - September 2005	3479,96	7772,76	729,80	2383,79	0,000
October –December 2005	1891,60	4441,36	606,71	2526,00	0,000
January – March 2006	4197,33	9357,27	1650,86	3852,94	0,019
April – June 2006	5041,27	9768,07	2335,33	5099,93	0,002
July - September 2006	3752,37	5806,12	1735,03	4267,41	0,000
October –December 2006	6366,54	17675,56	1927,31	5998,56	0,000
January – March 2007	3267,91	4343,66	1173,26	3183,39	0,000
April – June 2007	1781,42	2387,18	1148,07	3690,43	0,000
July - September 2007	3218,94	10523,64	602,28	1594,13	0,000
October – December 2007	2094,93	4252,16	659,78	1778,35	0,000
January – March 2008	650,82	733,85	405,17	1354,75	0,006
April – June 2008	220,39	889,14	70,97	249,52	0,005

Table 8 Costs per quarter of the year for the cases and the controls.

Furthermore, analysis of the costs per quarter of the year yields the same results. The cases have significant higher health care costs during the whole period from January 2005 till June 2008. Table 7 shows the mean costs per quarter of the year, the standard deviations and the significance of the differences.

Next, possible influences of the year of diagnosis on the results are analyzed. A two-way variance analysis (ANOVA) is accomplished to see whether the costs differ significantly

between the cases and controls when they were diagnosed for having cancer in respectively 2005, 2006 or 2007. Table 9 pictures that the year of diagnosis does not change the results. Being a case or a control is a significant factor but not the year in which the cancer was diagnosed. The interaction effect between the factors 'being a case or a control' and 'year of diagnosis' is not significant as well.

### Sensitivity analyses

Five sensitivity analyses are done to test whether excluding certain groups changes the previous results. The T-test analyses are repeated for the following groups: perfect matches, the non-extreme cases and their matching controls, breast cancer patients, non-imputed matches and for cases (and their matching controls) who had at least three psychosocial consults. At last, the costs of the psychosocial treatment are subtracted from the total costs to see whether these costs are the cause of the significant differences.

Excluding the imperfect matches did not change the results. The mean total health care costs of the cases still differ significantly from the mean total health care costs of the controls (table 10). The differences between the mean total health care costs are even bigger than in case of including the whole research sample.

The analyses are repeated for the different types of care. Table 11 shows the results of these analyses. Contrary to the previous results, the differences in transportation are not significant in this analysis, while the differences in alternative costs are. The costs of all other types of care still differ significantly from each other.

<i>Factor</i>	<i>Sig. (2-tailed)</i>
Being a case or a control	0,001
Year of diagnosis	0,457
Interaction effect	0,246

Table 9 Significance of year of diagnosis

	<i>N</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Sig. (2-tailed)</i>
Cases	44	41588,52	25968,79	0,000
Controls	226	12779,09	14377,05	

Table 10 Costs statistics for the perfect matches

	<b>Cases (N = 44)</b>		<b>Controls (N = 226)</b>		<i>Sig. 2-tailed</i>
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	
General practitioner	448,58	380,44	158,58	171,94	0,000
Hospital	32010,30	24697,63	9699,45	12258,59	0,000
Pharmaceuticals	3834,73	4753,41	1757,00	2077,71	0,000
Paramedical care	1208,31	1914,61	318,96	654,83	0,007
Alternative care	209,64	532,97	61,37	206,31	0,016
Aids and equipment	650,66	1141,69	291,95	752,07	0,010
Transport	454,31	1157,71	162,22	497,21	0,087

Table 11 Costs per type of care for only the perfect matches

	<i>N</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Sig. (2-tailed)</i>
Cases	62	33892,34	20080,43	0,000
Controls	266	13848,34	15689,70	

Table 12 Costs statistics of the non-extreme cases with their controls

	<b>Cases (N = 62)</b>		<b>Controls (N = 266)</b>		<i>Sig. 2-tailed</i>
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	
General practitioner	451,79	379,54	204,02	314,78	0,000
Hospital	24066,43	17495,85	10275,52	12970,88	0,000
Pharmaceuticals	4815,60	5160,84	2078,91	3400,69	0,000
Paramedical care	1279,99	1876,79	375,85	804,39	0,000
Alternative care	177,50	494,69	53,47	192,05	0,041
Aids and equipment	599,11	1039,03	284,59	711,22	0,004
Transport	358,65	994,35	205,14	658,33	0,122

Table 13 Costs per type of care for only the non-extreme cases with their controls

A second sensitivity analysis concerned the exclusion of the extreme cases (table 12 and 13). Again, significant differences in total health care costs between the cases and controls showed up when the extremes were excluded from the analysis (Sig. = 0.000). As much, the costs for the different types of care differ significantly between the two groups. The cases have higher health care costs for every type of care, except from transportation costs.

	<i>N</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Sig. (2-tailed)</i>
Cases	40	36724,97	21765,16	0,000
Controls	186	13397,53	15080,20	

Table 14 Costs statistics of only breast cancer patients

	<b>Cases (N = 40)</b>		<b>Controls (N = 186)</b>		<i>Sig. 2-tailed</i>
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	
General practitioner	541,19	402,58	209,30	349,82	0,000
Hospital	26683,37	19215,28	9492,26	12461,05	0,000
Pharmaceuticals	4920,41	4812,47	2201,77	3159,29	0,000
Paramedical care	1589,98	2114,14	459,00	927,61	0,001
Alternative care	211,86	556,04	75,27	231,82	0,027
Aids and equipment	625,40	617,35	258,31	449,80	0,002
Transport	438,00	1171,60	231,55	687,41	0,157

Table 15 Costs per type of care for only breast cancer patients

	<i>N</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Sig. 2-tailed</i>
Cases	46	388808,86	28265,80	0,000
Controls	113	15552,96	14114,96	

Table 16 Cost statistics for non-imputed matches

	<b>Cases (N = 46)</b>		<b>Controls (N = 113)</b>		<i>Sig. 2-tailed</i>
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	
General practitioner	411,13	306,88	258,02	424,50	0,000
Hospital	29204,55	26832,56	11974,53	11775,93	0,000
Pharmaceuticals	4396,93	5361,02	2425,43	3347,29	0,000
Paramedical care	1634,58	2162,43	428,90	880,54	0,002
Alternative care	184,73	542,86	34,17	161,76	0,024
Aids and equipment	668,21	1136,00	210,36	425,00	0,003
Transport	401,80	1101,32	179,45	499,96	0,123

Table 17 Costs per type of care for non-imputed matches

Furthermore, the analyses are repeated for only the breast cancer patients. The differences in total health care costs between the groups were significant once more (Sig. = 0.000), disadvantageous for the cases. The analyses for the differences in costs per type of care for only the breast cancer patients bring nothing new. Except from transportation costs, the costs for the different types of care are significantly higher for the persons receiving psychosocial treatment (table 14 and 15).

The fourth repetition of the analyses concerned only the matches for which the original data was complete (non-imputed matches). Many cases had more than one matching control, but the number of matching controls reduced as a consequence of deleting all the persons for which the data were not complete. When a case had no matches left, also this case is removed. Table 16 and 17 show the differences in costs between the cases and controls.

The last sensitivity analysis is accomplished for the cases who had at least three psychosocial contacts. The cases who visited the *Vruchtenburg* less than three times were deleted as well as their matching controls. Again, this did not make any difference for the results. The differences in costs are still significant for total health care costs as well as all the different types of care.

Finally, the effect of the costs of the psychosocial treatment on the differences in total health care costs is analyzed. However, subtracting the costs of the psychosocial treatment from the total costs did not make any difference. The health care costs of the cases are still significantly higher than the costs of the control group (table 20).

	<i>N</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Sig. 2-tailed</i>
Cases	58	40194,90	29288,41	0,000
Controls	256	12824,26	14484,63	

Table 18 Cost statistics for cases who had at least three psychosocial contacts

	<b><i>Cases (N = 58)</i></b>		<b><i>Controls (N = 256)</i></b>		<i>Sig. 2-tailed</i>
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	
General practitioner	460,39	360,38	183,54	187,57	0,000
Hospital	30556,88	28385,75	9622,62	12457,33	0,000
Pharmaceuticals	4194,12	4679,50	1778,12	2766,37	0,000
Paramedical care	1400,57	2004,30	360,00	748,00	0,000
Alternative care	187,33	507,32	60,34	207,11	0,041
Aids and equipment	608,36	1054,04	278,94	717,15	0,002
Transport	427,40	1050,00	185,26	639,07	0,016

Table 19 Costs per type of care for cases who had at least three psychosocial consults

	<i>N</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Sig. 2-tailed</i>
Cases	68	38502,37	28411,40	0,000
Controls	277	14003,71	15590,19	

Table 20 Effect of psychosocial healthcare costs on total health care costs

## Discussion and conclusion

In this study the possibilities for a psychosocial oncology cost offset study in the Netherlands are examined. The data existing in the Netherlands was sufficient to provide results: the prominent result of this study is that psychosocial care provided to cancer patients does not lead to medical costs offset. The mean costs of the person who received psychosocial care are more than twice as high as the mean costs of the persons who did not receive a psychosocial treatment. The costs of this psychosocial treatment are not the reason for these differences. Subtracting these costs from the total health care costs does not change the results. Another remarkable thing is the fact that the group receiving psychosocial care do also use more paramedical care, alternative care and aids and equipment than the group not receiving this psychosocial treatment.

### Limitations of this study

The high differences in health care costs found between the two groups in this study can be a result of the methodological limitations of this study. At first, there is an uncontrollable selection in the beginning of this study. This study is accomplished with existing data what resulted in an existing group of cancer patients receiving psychosocial treatment and an existing group of cancer patients not receiving psychosocial treatment. The choice of using psychosocial care or not is made before this study and is therefore not controllable in this study resulting in an inevitable selection effect.

A second problem is the fact that the necessary data for this study were partly not available. The number of possible cases reduced from 211 till 68 for several reasons: 1) cases were not findable in the databases of health insurer *Achmea*, 2) the type of cancer are only identifiable since 2005 which is necessary for finding controls with the same type of cancer, 3) people switched health insurer after 2006 resulting in incomplete data and 4) the choice that the psychosocial treatment had to be completed before 2008 to have any insight on the long term costs effects. The fact that patients had to be excluded from this study for these reasons results in another unintentional selection effect. As described in the methodology chapter, the demographic characteristics and the cancer types of the research sample differ from the demographic characteristics and cancer types of all cancer patients in the original *Achmea* database. Women are overrepresented in the sample, the sample is younger and breast cancer is the major type of cancer instead of skin cancer. This selection effect may influence the results.

The fact that the diagnoses could not be assessed prior to 2005 results in uncertainty about the medical history of the persons in the research sample. Imperfect matches can be

made in case of different medical histories concerning cancer. The type of cancer as well as the number of disease episode may be different between the matches. There are probably persons in the research sample whose cancer type is assessed based on dissemination instead of the original type of cancer and the moment of diagnosis is probably based on a second or third disease episode for a control while it is the first for the case (or the other way around).

Next, in the matching process there is matched on different variables, like gender and age. There are more variables which influence and health status and health care utilization which are not included as matching criteria, like socio-economic status. Mental disorders (e.g. depression) are about twice as frequent among the low-income groups as in the high-income groups in populations and have highest prevalence among the lowest-educated or unemployed people (WHO 2007). Social economic status is not included as a matching criterion because these data were not available. A proxy for this missing variable could have been region. In some degree, region can image the socio economic environment of the cases and the controls. The cases (clients of the *Vruchtenburg*) are all living in the region of Rotterdam, while the controls are taken out of the whole field of activity of *Achmea* (which is the Netherlands as a whole). Zip codes were provided of the whole research sample. However, region is not used as matching criterion because including this criterion would have resulted in zero matches. Nevertheless, before 2006 the whole research sample was insured by the Sickness Insurance Fund which was only for the lower incomes. So in some way the cases are matched to the controls by income.

Region was planned to be included as a matching criterion for another reason. Evidence shows that people from different regions have different health care utilization behaviours. For this difference in health care utilization is not corrected. Likewise, as drawn attention to earlier, prices of certain types of care can differ considerably among regions. For these price differences is not corrected as well.

Due to switching health insurer in the year 2006, data before this year was missing. This resulted in two limitations. At first, the matching variable mental health status prior to cancer diagnosis was not identifiable for everyone. For many persons the data before 2006 was not complete and therefore the mental health problems prior to cancer diagnosis could not be assessed. If data was missing, the assumption is made that this person had no mental health problems prior to cancer diagnosis. This may be a wrong assumption, but because of lacking data unfortunately inevitable.

Another problem arising from this missing data was the incomplete cost data. The imputation technique used for filling up the missing data is not the best available technique. The missing data could not be completed in a better way, because of lack of time. Though, this method brought us a long way. The sensitivity analysis for only the non-imputed cases

proves that the imputation technique used had a minor effect on the results. Nevertheless, in subsequent studies this can be improved. Moreover, the missing data for the year 2005 for several controls resulted in incomplete costs for the different types of care. This incompleteness is not removed. The imputation technique is used to fill up the gaps per quarter of the year but not the costs per type of care. This incomplete data influences the differences in costs per type of care. If the data had been complete, the differences in costs per type of care would have been lower than presented here, because the costs of above all the controls were missing. Comparing the costs of the whole research sample with the costs of only the non-imputed cases shows that the costs per type of care for the controls would have been approximately 8 % higher when the data had been complete. However, the differences in costs are still significant.

Because it is not possible to go far backwards in time, the long-term effects of the psychosocial treatment are not exactly identifiable, assuming that the cost offset effects of the psychosocial treatment on health care utilization takes some time. Furthermore, there are cases who visited the *Vruchtenburg* only once. This probably influences the effectiveness of the treatment. Next to that, there is no distinction made between the different types of psychosocial care. Some cases visited group sessions, others creative therapy or individual psychological consults. The effectiveness of the psychosocial therapy on the medical cost offset is probably influenced by the type of psychosocial treatment.

A last problem is the fact that health insurers in the Netherlands pay for DBCs (hospital care above all) whenever the DBC is finished off. Because DBCs can be open for one year, parts of the costs were probably not included in the databases of the health insurer yet. The data from June 2007 till June 2008 were probably incomplete, because of these unfinished DBCs.

#### Further notifications

On the basis of the limitation of this study, some notification can be made for the high differences in costs that are found. At first, the methodology of this study could not avoid the selection effect in choice of cancer patients to use psychosocial care or not. These differences in needs and choices can be a clarification for the high cost differences found. People who want and use psychosocial treatment are probably 'heavier users of care' than persons who do not use / need psychosocial care. Another explanation can be the different health care beliefs people have, resulting in different choices related to psychosocial care. Some people want medical assistance all the time even when they are cured, while others want to forget the things happened as soon as possible and want to leave that medical environment. This selection effect makes it hard to assign the differences in health care costs



to the psychosocial treatment or the uncontrollable selection in persons who choose to visit the *Vruchtenburg* or not.

Another explanation can be the fact that the cases are more severe cancer cases than the controls. Because detailed data about diagnosis were missing before 2005, matching on number of disease episode and degree of dissemination was impossible. It could be that, by accident, the cases are more severe cases than the controls (in number of disease episodes or degree of dissemination).

Besides, it could be that the caregivers of the *Vruchtenburg* encourage the help-seeking behaviour of the client by drawing attention to other opportunities to receive care and feel better, like paramedical services or alternative care. The cases will be more inclined to use those types of care than the people who are not attended to these opportunities. This will result in higher health care costs of the cases and may partly clarify the differences between the cases and the controls in this study.

A last explanation can be the uncorrected differences in region. The differences in region can be associated with differences health care utilization behaviour, differences in prices of care and differences socio economic status causing different health states and different utilization behaviour. The cases were selected out of the region Rotterdam, while the controls were selected out of the Netherlands as a whole. This makes it not unlikely that this region effect influenced the results in some way.

#### Recommendation for further research

Further study is necessary to falsify the theory that psychosocial treatment to cancer patients leads to medical costs offset, since this study is steered by limitation and choices. Further study can be a reprise of this study a few years from now. The databases of health insurers will be more complete by then and better data will be available about medical histories and diagnoses, what can improve the matching process. More health insurers should be included in the study to redress the problem of persons changing insurer. The selection effect by the persons themselves can still not be redressed.

Another option is doing a randomized controlled trial in which cancer patients who report to be interested in psychosocial care are divided in a case and a control group. Than the first selection effect of this study is redressed, what makes matching unnecessary. Health care utilization and associated costs can be kept up prospectively. Yet, this option is more expensive and more time consuming.

The long-term cost effect of the psychosocial treatment could not be assessed very well in this study. A longer time span for further study is suggested, to see whether the costs offset effects take some time.

Lastly, since this study is highly dependent on the selection of cancer patients who use psychosocial care, further research into the characteristics of the persons using this type of care is subject for consideration. Which persons are referred to psychosocial healthcare providers and which persons act upon this referral? Factors as the personal environment of the cancer patient, the socio economic status, the severity of mental problems and the relationship with the physician can play a role in this selection. More information about the patient characteristics can give insight in motives to use psychosocial care and can probably clarify the differences in costs found in this study. Moreover, the people using psychosocial care are, according to this study, an expensive population in health care. This population is therefore an interesting research population, since high benefits can be achieved in case of reducing health care costs. Further research into the (cost-) effectiveness of psychosocial treatment is recommended; what happens with the quality of life and the health care costs of these persons when they do not receive psychosocial treatment? And how can the (cost-) effectiveness of psychosocial treatment be increased?

In conclusion, the results of this study appeal for further research, what can be done in different ways.

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