

Thesis

Testing a Potential Improvement of the Dutch Risk Equalization System: A Risk Adjuster Based on the Prior Use of Social Care

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AI statement

Artificial Intelligence was used in this thesis as a supportive tool. Google Translate was used to translate specific words from Dutch into English. Claude AI was used to suggest code for the methodology, which was then applied in Stata to produce the results. Claude was also used to identify grammar and spelling errors. The suggested corrections were reviewed and applied in the text manually.

Abstract

Background: The Dutch risk equalization system compensates health insurers for predictable differences in healthcare costs across insured individuals. In the current model certain subgroups remain under or overcompensated, creating incentives for health insurers for risk selection. This thesis studies the possibilities and effects of improving the Dutch risk equalization system with risk adjusters based on prior use of social care.

Methods: This thesis used data on all insured individuals in the Netherlands within the CBS environment. The dataset included actual healthcare costs and predicted healthcare costs for 2023 based on the 2026 risk equalization model. Over- and under compensation were calculated for social care users and for the different types of social care. Prior social care use was also assessed against the WOR 1234 framework for risk adjusters.

Results: The current risk equalization model undercompensates insurers for social care users in the previous year by an average of €270 per person per year. OLS regression confirms that prior social care use is significantly associated with higher residual healthcare costs ($p < .01$). But using it as a risk adjuster does not meet the criteria of validity and measurability at the moment.

Conclusion: Based on the results of the first three steps, prior use of social care shows potential as a risk adjuster, as it is associated with predictable losses for insurers and meets criteria of the equalization performance and efficiency incentives. However, validity and measurability currently pose as obstacles to implementation as a risk adjuster. Measures to make social care data available nationwide are required before social care use in previous year can be included into the Dutch risk equalization model.

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1. Introduction

1.1 Problem definition

The Dutch health insurance market is based on regulated competition. Health insurance companies compete within a set of government implemented rules to ensure accessibility, affordability and solidarity. The government tries to reach these goals by forbidding risk-adjusted premiums, open enrolment and insurance mandate. To prevent risk selection by insurance companies, risk equalization is realized (Van Kleef et al., 2013).

Risk equalization (*risicoverevening* in Dutch) is a crucial part of the Dutch healthcare system. Health insurance companies receive compensation for each insured individual, with the level of compensation based on expected healthcare expenditures. These expected costs are calculated by Zorginstituut Nederland and are primarily determined by factors such as age, gender, prior medication use, and diagnoses (Van Kleef et al., 2013).

Studies evaluating the performance of the current risk equalization system have already been conducted (Van Kleef et al., 2013; Van Kleef & Van Vliet, 2025). These evaluations show that for groups with chronic conditions in year t-1, on average most healthcare costs are compensated. But for some specific chronic conditions under- and overcompensation persist. Same also counts for subgroups based on non-chronic conditions. Indicating that further improvements are needed.

There are three ways to reduce risk selection in regulated health insurance markets: refining the risk equalization model, allowing insurers to set risk-based premiums, and introducing ex post compensation for actual losses (Van Kleef et al., 2013). This thesis focuses on the first approach by examining whether the risk equalization model can be improved through the inclusion of risk adjusters based on prior use of social care.

Prior use of social care refers to expenditures covered under the *Wet maatschappelijke ondersteuning* (Wmo 2015). The aim of this legislation is to enable independent living and prevent avoidable hospital admissions by providing support to vulnerable individuals (Lansingerland Rekenkamer, 2021). Receiving social care may therefore serve as an indicator of vulnerability and are at increased risk of higher future healthcare costs.

1.2 Academic relevance

The current risk equalization model uses information on age, gender, region, source of income, Pharmacy based cost groups (PCG's), Diagnose based cost groups (PCG's) and socioeconomic status (SES). Several options to enhance the system have already been researched, such as using information on physiotherapy diagnoses (Eijkenaar & Van Vliet, 2017) or multiple-year high-cost indicators as a health measure (Van Kleef & Van Vliet, 2012). However, including a risk adjuster based on prior use of social care has not been researched yet. Including this may further improve risk equalization models.

1.3 Research questions

This leads to the following research question: What are the possibilities and effects of improving the Dutch risk equalization system with risk adjusters based on prior use of social care?

Sub-questions

1. What are the characteristics of people with prior use of social care in terms of age and health?
2. To what extent is the prior use of social care (Wmo 2015) associated with higher healthcare spending (Zvw)?
3. To what extent is the prior use of social care (Wmo 2015) associated with higher RESIDUAL healthcare spending (Zvw)?
4. To what extent does prior use of social care fulfil the criteria for risk adjusters?

By answering the sub questions, the main question can be answered. Sub-questions one and two provide an initial perspective on the association between social care use in previous years and healthcare expenditures. Sub-question three examines the extent to which prior social care use is associated with healthcare costs after risk equalization. And finally, sub-question four answers the question whether social care use in previous years meets the criteria of the 1234 WOR assessment framework (Ministerie van Volksgezondheid, Welzijn en Sport, 2024).

1.4 Societal relevance

Despite continuous improvements, the current risk equalization system does not completely compensate insurance companies for predictable variation in healthcare costs (Van Kleef & Van Vliet., 2025). As a result, certain subgroups are not fully compensated, leading to predictable losses for insurers. These predictable losses create incentives for risk selection, as argued by Van de Ven and Ellis (2000). Risk selection is socially undesirable as it discourages insurers from investing in efficiency and quality improvements in healthcare (Van Kleef et al., 2013). If the data-analyses of thesis indicates improvements, it can be beneficial for social care users to include prior use of social care as a risk adjusters in the risk equalization system.

1.5 Thesis outline

This thesis consists of several chapters trying to answer the research question. The next chapter will provide an overview of the relevant literature. After this the methodology chapter describes the data and empirical strategy used to answer the research question. The results obtained by the empirical strategy will be presented and in the final chapter they will be interpreted in the discussion and conclusion.

2. Theoretical framework

This chapter presents existing theories on regulated competition in the Dutch health insurance system, the role and relevance of risk equalization, the functioning of the Dutch risk equalization system, a brief overview of social care, the quantitative evaluation measures and criteria for risk adjusters. These concepts serve as the theoretical framework which this thesis builds upon.

2.1 Regulated competition in the Dutch basic health insurance

Since 2006, the Dutch health insurance market has operated under its current system, in which competition was introduced to encourage health insurers to deliver healthcare more efficiently (Zorgverzekeringswet, 2026). Individuals are free to choose their health insurer each year. Because of this, insurers compete for customers. This competition creates incentives for insurers to control costs and operate efficiently. Health insurers can selectively contract with health care providers. They can distinguish themselves by negotiating about the price and quality of the health care service. In theory, competition can therefore improve the quality of care and reduce healthcare costs (Borkent et al., 2016).

However, this competition takes place within a regulated framework that is designed to preserve accessibility and solidarity in the health insurance system. The content of the basic health insurance package is determined by law, meaning that the government decides which types of care are included. All individuals are obliged to have basic health insurance and insurers are required to accept all applicants. In addition, the premium for the basic insurance is community rated, meaning that premiums cannot be differentiated according to individual characteristics such as age, gender and health. Individuals with the same insurance plan therefore pay the same premium. Insurers also have a duty of care, which means that insured individuals must be able to receive healthcare within a reasonable time and distance (Ministerie van Volksgezondheid, Welzijn en Sport, 2025a).

2.2 The role and relevance of risk equalization

In a competitive insurance market without regulation, large differences in expected healthcare costs could lead to large differences in premiums. In some cases the maximum premium for high-risk individuals could exceed the average premium by a factor of ten or more. This would mean that individuals with poor health would have to pay much higher premiums compared to healthier individuals. Because accessibility is an important principle of the Dutch healthcare system, premiums for the basic health insurance are community rated and do not vary according to individual risk (Van de Ven & Ellis, 2000).

However, community rating creates predictable profits and losses for insurers. Individuals with high expected healthcare costs generate predictable losses for insurers, while individuals with low expected costs generate predictable profits. In theory this system

creates cross-subsidies from low-risk individuals to high-risk individuals. In practice this outcome may not be achieved because insurers and individuals may respond to incentives for risk selection (Van de Ven & Ellis, 2000).

One example is adverse selection, where low-risk individuals try to separate themselves from high-risk individuals by switching to health plans that are more attractive for healthier individuals. As a result, insurers with a large share of high-risk individuals may have to increase their premiums. This can lead to a so-called “death spiral,” where healthier individuals leave the insurance pool and access to insurance for high-risk individuals becomes difficult or even impossible (Van de Ven & Ellis, 2000).

Another potential effect of regulation in health insurance markets is cream skimming. In this case insurers try to attract low-risk individuals and avoid high-risk individuals, even though they are required to accept all applicants. Insurers may do this through selective marketing, by contracting healthcare providers that are less attractive for high-risk individuals, or by designing insurance plans that are more appealing to healthier individuals. Cream skimming can reduce incentives for insurers to respond to the preferences of high-risk individuals (Van de Ven & Ellis, 2000).

One of the most concerning forms of risk selection is quality skimming. This happens when insurers deliberately reduce the quality of their services to discourage high risk individuals from enrolling. Insurers may selectively contract healthcare providers who deliver lower quality care or avoid high-quality specialists who tend to attract patients with high healthcare costs. This creates incentives for healthcare providers to lower the quality of care they deliver (Van de Ven et al., 2015)

Risk equalization is introduced to prevent these forms of risk selection. Through risk equalization insurers receive financial compensation for individuals with higher expected healthcare costs. The better the risk equalization model predicts healthcare costs, the smaller the financial incentives for insurers to engage in risk selection (Van de Ven & Ellis, 2000).

2.3 The functioning of the Dutch risk equalization system

Health insurers in the Netherlands have two main sources of income. The first source is the nominal premium that is paid by insured individuals aged eighteen and older. The second source is the risk equalization payment from the Health insurance fund (*Zorgverzekeringsfonds*) that is financed through income-related contributions. The aim of the Dutch risk equalization system is to reduce incentives for risk selection, to create a level playing field between insurers regardless of the composition of their insured population, and to improve efficiency in healthcare (Ministerie van Volksgezondheid, Welzijn en Sport, 2017).

Risk equalization payments are determined before the start of the calendar year. This means that insurers bear financial risk, which stimulates them to operate efficiently. The characteristics of insured individuals on which insurers receive compensation are referred to as risk adjusters. Risk equalization aims to compensate insurers for predictable differences

in healthcare costs that come from differences in health status, rather than for costs resulting from inefficiency or supply factors (Ministerie van Volksgezondheid, Welzijn en Sport, 2017)

The Dutch risk equalization model includes several risk adjusters, such as age, gender, region, income source, SES, pharmacy-based cost groups, diagnosis-based cost groups and multiple-year high costs. Over time additional variables have been added to the model in order to improve its predictive performance. Although the inclusion of these variables has reduced the average under- and overcompensation across individuals, these differences have not disappeared completely (Van Kleef et al., 2013). Currently, the use of social care is not included as a risk adjuster, but it may have the potential to improve the predictive performance of the risk equalization model.

The Dutch risk equalization model is based on three components. The amount of equalization contribution insurers receive is dependent on the predicted costs for somatic care, mental care and out of pocket payments under the mandatory deductible. The somatic and mental care costs are added with each other and the out of pocket payments are subtracted (Ministerie van Volksgezondheid, Welzijn en Sport, 2025b).

Based on the WOR 1277 a list of risk adjusters included in the risk equalization model can be made. In total there are fifteen risk adjusters in the risk equalization model. For somatic care 243 risk classes are defined, for mental care 133 risk classes and for costs under the mandatory deductible 74 risk classes can be defined. In the table below an overview of the model is given.

Table 1

list of risk adjusters based on the risk equalization model of 2026.

Risk adjuster¹ Abbreviation	Description	Number of risk classes		
		Somatic care	Mental care	Out of pocket²
Age/Gender	Age interacted with gender	42	30	30
PCG	Pharmacy-based cost groups	50+1	9+1	-
DCG	Diagnoses-based cost groups	26+1	16+1	-
SOI	Source of Income interacted with gender	36	29	29
REI	Region	10	10	10
SES	Socioeconomic status interacted with gender	12	8	-
PPA	Persons per address interacted with age	19	18	-
MHC	Multiple-year high-cost groups	8+1	7+1	1+1
PDG	Physiotherapy diagnosis cost groups	4+1	-	-
MHC	Multiple year home care costs	9+1	-	-
HSM	Historical somatic morbidity	1+1	-	-
IBP	Indicator for birth and pregnancy	3+1	-	-
SEI	Seasonal workers	3	3	3
HDC	Historic device cost	6+1	-	-
MCH	Missing cost history	4+2	-	-
Total		243	133	74

¹Based on the WOR 1277

²out of pocket spending under the mandatory deductible

2.4 Social care

In 2015 the social care act (*Wet maatschappelijke ondersteuning*) was introduced. Under this law, municipalities are responsible for supporting individuals. This support is intended to promote living independently at home for as long as possible and for participation in society. Municipalities can provide two different types of support, general support and personal support. General support is for all citizens like for example a community centre. Personal support is provided based on an individual's circumstances and needs (Ministerie van Volksgezondheid, Welzijn en Sport, 2022 & Ministerie van Volksgezondheid, Welzijn en Sport, 2016).

Municipalities support individuals through social care who are not able to participate in society. Social care includes several types of support, such as accompaniment, household assistance, social support, financial support and day-care activities. Other examples of social care provisions are asylum for victims of domestic violence or a protected living environment for people with a long-term mental disorder. These services are intended to help individuals maintain their independence and prevent or delay the need for more intensive healthcare services (Ministerie van Volksgezondheid, Welzijn en Sport, 2022 & Ministerie van Volksgezondheid, Welzijn en Sport, 2016).

Citizens can make a claim on social care in consultation with neighbourhood teams (*wijkteams*). In a conversation (*keukentafelgesprek*), what support is needed from the municipality and what the client is still able to do independently is discussed. Following this conversation, a recommendation is made as to whether the client requires support or whether their needs can be met through their own social network. If social care is granted, there are two ways this can be arranged: Either in nature where the municipality arranges the support directly, or through a personal budget (*persoonsgebonden budget*), which allows the client to arrange their own support. The social care act is financed through the central government. Municipalities receive funding which they are free to spend on the implementation of the law (Ministerie van Volksgezondheid, Welzijn en Sport, 2016).

Research by Cramer et al. (2018) shows that individuals who make use of social care have higher utilization of healthcare services compared to individuals who do not use social care. On average, social care users visit their general practitioner twice as often. This suggests that individuals who use social care often have greater healthcare needs. As a result, the use of social care may be associated with higher healthcare costs. Given that certain groups with high healthcare costs remain undercompensated on average, social care users may be such group. That is why this study investigates the potential of adding social care use as a risk adjuster in the Dutch risk equalization model.

2.5 Quantitative evaluation measures of selection incentives

A common approach to estimating a risk equalization formula is the Ordinary Least Squares (OLS) method, in which individual healthcare expenditures are regressed on a set of risk adjusters. OLS allows the calculation of the R^2 statistic, which is commonly used as an indicator of model predictive performance (Van de Ven & Van Kleef, 2024). A higher R^2 indicates that a larger share of the variation in healthcare expenditures is explained by the included risk adjusters.

However, a higher R^2 does not necessarily correspond to smaller predictable profits and losses for specific subgroups. As a result, relying only on the R^2 statistic may give a misleading impression of how much selection incentives are reduced (Van de Ven & Van Kleef, 2024).

Another important concept when evaluating selection incentives is predictable profits and losses. This happens when risk equalization payments systematically differ from the actual healthcare expenditures of specific groups of insured individuals. If the payment for a subgroup is lower than the actual healthcare costs, insurers incur predictable losses for this group. If the payment is higher than the expected costs, insurers earn predictable profits. These predictable profits and losses can create incentives for insurers to engage in risk selection (Withagen-Koster et al., 2023).

2.6 Criteria for risk adjusters

When introducing new risk adjusters, several criteria should be considered. According to the 1234 WOR assessment framework there are four categories which need to be accounted for. The first principle is the equalizing effect, second is efficiency of the risk adjuster. The third is manageable complexity. The final principle is validity, measurability and stability. These principles are in line with the goals that are defined of risk equalization of creating an equal playing field for health insurers (Ministerie van Volksgezondheid, Welzijn en Sport, 2024).

The first principle is risk equalization performance, which refers to the extent that the model aligns predicted costs with actual healthcare expenditures. A good performing model makes sure that insurers are the predicted costs are in line with the actual healthcare costs. This reduces predictable profits and losses and removes incentives for risk selection. The predictable profits and losses should be as close to zero as possible (Ministerie van Volksgezondheid, Welzijn en Sport, 2024).

The second principle concerns efficiency incentives. While risk equalization tries to reduce incentives for risk selection, it should not undermine incentives for insurance companies to operate financially efficient. Risk adjustment mechanisms based on past costs can decrease incentives for cost control. Therefore, any model adjustment must be assessed in terms of its potential to create unwanted incentives for inefficient behaviour. A more qualitative assessment is required for this category (Ministerie van Volksgezondheid, Welzijn en Sport, 2024).

The third principle is manageable complexity. Although adding more criteria might improve risk equalization performance, it may also increase the complexity of the model. Higher complexity can reduce transparency or increase the risk of errors. Therefore any increase in complexity must be weighed against the expected gains in performance and efficiency. This principle also involves a qualitative analysis (Ministerie van Volksgezondheid, Welzijn en Sport, 2024).

The fourth principle includes validity, measurability, and stability. These are essential requirements for including any criteria in the equalization model. Validity implies that a criterion is meaningfully related to predictable healthcare costs and be influenced as little as possible by the behavior of insured persons, healthcare providers, or other parties. Measurability requires that the data be consistently available for all individuals. A risk adjuster is also measurable when it classifies individuals into classes objectively. Stability refers to consistency over time, making sure that the model remains predictive in future periods (Ministerie van Volksgezondheid, Welzijn en Sport, 2024).

In this thesis, these criteria are used to evaluate whether indicators based on prior use of social care utilization could function as an appropriate risk adjusters in the Dutch risk equalization model.

3. Data and empirical strategy

This chapter describes the set-up of the methodological approach to answer the research question. First the characteristics of the relevant variables used in the analysis are presented. Also, a step by step explanation of the empirical strategy is described. And the validity and reliability of the outcomes are discussed.

3.1 Study design

The first three steps of the methodology are quantitative, observational research design. Using individual-level data on healthcare expenditures and existing risk adjusters, the risk equalization model of 2023 is reproduced. The study design is descriptive and focuses on under/overcompensation and the R^2 . The last step of the analysis is qualitative where social care use is assessed on the criteria for risk adjustment.

3.2 Data

The data used in this thesis consist of two microdata datasets obtained from the central bureau of statistics (CBS). In the environment of Central bureau of statistics (CBS) these two datasets can be combined (Centraal Bureau voor de Statistiek, 2025). The first set contains information of 17,792,868 people under the health insurance act in 2023. Examples of information that are included: age, socio economic status (SES), and morbidity indicators. The dataset includes actual individual healthcare expenditures for 2023 as well as the predicted health care expenditures for 2023 based on the 2026 risk equalization model. A list of variables used for the analysis are presented in table below.

Table 2*Descriptives of dataset with risk adjusters and healthcare costs*

Variables	Description	Average^{1,2}	SD
Healthcare costs	Total healthcare costs of individuals in 2023.	2956.30	10733.81
Somatic care costs	Total somatic care costs of individuals in 2023.	2833.77	10077.49
Mental care costs	Total mental care costs of individuals in 2023.	316.21	3595.22
Out of pocket spending	Total out-of-pocket spending due to the mandatory deductible of individuals in 2023.	193.67	177.60
Age	Age of individuals in 2023	42.33	23.63
DCG	Percentage of individual included in a diagnostic cost group	11.90%	0.32
PCG	Percentage of individual included in a pharmacy cost group	26.86%	0.44
MPC	Percentage of individuals included in a multiple year pharmacy costs	30.30%	0.46
MHC	Percentage of individuals included in a multiple year high somatic costs	43.77%	0.50
PPCG	Percentage of individual included in a psychological pharmacy cost group	4.58%	0.21
PDCG	Percentage of individual included in a psychological diagnostic cost group	5.11%	0.22
PMCG	Percentage of individuals included in a psychological multiple year high somatic cost	7.90%	0.27
HDC	Percentage of individuals included in a historic devices cost group	8.34%	0.28
SES very low	Percentage if individuals with a very low socio economic status	21.77%	0.41
SES low	Percentage if individuals with a low socio economic status	19.56%	0.40
SES middle	Percentage if individuals with a middle socio economic status	29.35%	0.46
SES high	Percentage if individuals with a high socio economic status	29.32%	0.46

¹The average is based on data from 2023 with 17,792,868 observation.²The average is weighted by the fraction of the year that people were insured in 2023.

The second dataset contains information on the use of social care (*Wmobus*). This data consists of the different types of support arrangements provided by the when making use of social care. Municipalities can choose voluntarily to send their social care data to the CBS. In 2022 94% of municipalities supplies data and allows publication (CBS, 2026a).

Because of this the next disclaimer must be used when making use of this dataset: "Please note that when a total figure for social care clients is based on the sum of the municipalities, this constitutes an underestimate of the total number of clients receiving support under the Social Support Act (*Wet maatschappelijke ondersteuning*). This underestimate stems from the voluntary nature of the monitor; not all municipalities in the Netherlands submit their data to the central bureau of statistics Netherlands (CBS)." (CBS, 2026a).

Nineteen different types of social care are included in the list. Only social care type nine has no users. In total there are 1.090.024 individual who make use of one or multiple types of social care. Because the use of social care in previous year is assessed in this thesis, only the data of 2022 will be used (CBS, 2026b). Based on this dataset, a list of variables used is provided in table. This table includes all types of social care that can be called upon. Most types have at least a thousand users, but some are used very rarely like type 17 (emergency asylum) and 19 (generic allocation).

Table 3
Types of social care

Variables	Label	Number of users in 2022 ¹
01	Help with chores	466164
02	accompaniment	186816
03	Personal care	3241
04	Short stay	1477
05	Living services	5828
06	Other support aimed at the individual or household/family	3735
07	daytime activities	65344
08	Transport services	164484
09	Other group-oriented support	0
10	Other tailor-made arrangements	70500
11	Wheelchair	117282
12	Transport arrangements	476724
13	Living arrangements	144413
14	Other tools	2756
15	Being protected	25649
16	Asylum	6500
17	Emergency asylum	248
18	Other protected living and asylum	1303
19	Generic allocation	225
Total	Total number of individuals who made use of social care	1090024

¹Number of people who used the type of social care in 2022.

"Throughout the analysis individuals were weighted with the fraction of the year they were insured. For example: a person who had insurance for only 3 months with healthcare costs of 1,000 euro's the spending was annualized to 4,000 euros $[1,000/(3/12)]$ and included a weight of 0.25 (3/12). This way, mean healthcare costs, mean age, mean under/overcompensation etc. can be interpreted as the mean of these variables per insured year. This is a standard procedure in risk equalization research" (Van Kleef et al., 2018).

3.3 Data analysis

The data analysis is done using Stata. The analysis consists of four steps. Each step will answer a sub-question.

Step 1. Descriptive analysis

First, descriptive analyses are conducted to gain an image of the group who use social care in the previous year. The average age of the total population is compared to the average age of the social care users in previous year. To compare the health status between the two groups morbidity groups are used. A higher percentage of individuals included in morbidity groups indicates higher use of healthcare. In turn, a higher use of healthcare indicates worse health. SES groups also give indication of health. Relatively more individuals with low SES indicate worse health status (Wang & Geng, 2019). These results are used to answer the first sub-question.

Step 2. Healthcare costs

The second step consists of two parts, the first is to calculate the average healthcare costs of individuals who use social care and compare this to the population average. In the second part, the predictive power of social care use is simulated. Healthcare costs are made up of three variables: somatic care and mental care costs are added up and out of pocket costs under the mandatory deductible is subtracted. For extra information, the average of these three costs are also calculated for previous social care users and compared the population average. This might give interesting insights in what causes the difference in healthcare costs.

Also for every type of social care, the average somatic care, mental health care and out of pocket costs are calculated. This gives an image on the differences of average healthcare costs between the use of different types of social care in the previous year.

A regression analysis is performed in which the dependent variable equals the healthcare costs in 2023. In equation 1 the explanatory (dummy) variable is the use of social care in 2022. This equation is performed four times for healthcare costs, somatic care costs, mental care costs and out of pocket spending. The same is done for equation 2, where the explanatory (dummy) variables are the different types of social care. For both equations, the R^2 will be obtained to see how much of the variance costs is explained by use of social care.

Equation 1

$$Y = \beta_0 + \beta_1 X_1 + e$$

Y = Average costs

X_1 = Yes/no of social care in the previous year

β_0 = Intercept

β_1 = Regression coefficient

e = Error term

Equation 2

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{19} X_{19} + e$$

Y = **Average** costs

X_1 – X_{19} = Yes/no use of social care in the previous year per type of social care (see Table 3)

β_0 = Intercept

β_1 – β_{19} = Regression coefficients

e = Error term

Step 3. Residual healthcare costs

The third step also consists of two parts. First the average residual healthcare costs for the total population and for of prior social care users are calculated and compared. Residual healthcare costs are the expected healthcare costs in 2023 (according to the risk equalization model 2026) minus the actual healthcare costs in 2023. An average positive residual healthcare costs mean profits for insurance companies because the money they receive is higher than the actual costs. Consequently, an average negative residual cost means losses for insurance company. To find out what causes the over/under compensation in healthcare costs, the residual costs are also calculated for somatic care, mental care and out of pocket payment under the mandatory deductible.

For every type of social care use the average residual healthcare costs, somatic care costs, mental care costs and out of pocket spending is calculated. This gives an impression about the associated losses and profits per type of social care. Some type might on average overcompensate while other undercompensate.

Equation 3 is a regression analysis where the dependent variable is the residual costs in 2023. The explanatory (dummy) variable is use of social care in 2022. In equation 4 the explanatory (dummy) variables are the different types of social care use. For both equations, the regression is run for the four types of residual costs. The main result that will be interpreted is the R^2 . This gives an indication of the additional predictive power that could be added to the risk equalization model by including prior use of social. These results are used to answer the third sub-question.

Equation 3

$$Y_{res} = \beta_0 + \beta_1 X_1 + e$$

Yres = **average** residual costs

X_1 = yes/no of social care in the previous year

β_0 = intercept

β_1 = regression coefficient

e = error term

Equation 4

$$Y_{res} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots \beta_{19} X_{19} + e$$

Y_{res} = average residual costs

X_1 – X_{19} = yes/no use of social care in the previous year per type of social care (see Table 3)

β_0 = intercept

β_1 – β_{19} = regression coefficients

e = error term

Step 4. Appropriateness of social care use as risk adjuster

The final step is an analysis of whether adding prior use of social care to the risk equalization model is appropriate. To assess this, the criteria of the WOR 1234 assessment framework are used (Ministerie van Volksgezondheid, Welzijn en Sport, 2024). Prior use of social care is evaluated on equalizing performance, efficiency, manageable complexity and validity, measurability and stability. The detailed explanation of these criteria is provided in the theoretical framework.

The elements of the framework must be assessed in conjunction. Equalization effect is in constant search for balance with efficiency and manageable complexity. Often the expansion of the risk equalization model leads to an improvement of the equalization effect, but it can lead to perverse incentives for insurers or increase in complexity of the model. The criteria of validity, measurability, and stability must always be met. (Ministerie van Volksgezondheid, Welzijn en Sport, 2024). These results are used to answer the fourth sub-question.

3.4 Validity and reliability

This study relies on the data from social care use from 2022 and healthcare costs from 2023. There are some things to consider when interpreting the results.

The internal validity of this study is strong. This thesis uses the actual health care costs for all individuals in the Netherlands. This ensures the validity because there can be no sampling error that is possible when researching a sample of the population. However, this does not count for the social care users. Not all social care users are known. Only municipalities who granted access and permission for publication are included (CBS, 2026a).

There is empirical evidence that municipalities differ in how they interpret and implement social care. This can lead to differences in assessments of social care receivers (Oosterhoff et al., 2025)). As a result, the differences in social care use may reflect administrative practices rather than underlying need, which may weaken the validity of the study. In the discussion this point will be addressed further.

4. Results

In this chapter the most important results are presented. Every section answers a specific sub-question. The results of the first step are presented in which the descriptive results are compared (section 4.1). The results of the second step show whether prior social care use is associated with higher healthcare costs (section 4.2). The third step shows if prior social care use is associated with higher residual healthcare costs (section 4.3). And the last step assesses if it is appropriate to include prior use of social care as a risk adjuster (section 4.4).

4.1 Results step 1

In this section the outcomes are presented to answer the first sub-question. Table 4 presents the averages of the descriptives for the total population and social care users. The results show that there are differences between the two groups for age and health. The age of social care users on average are more than 23 years higher compared to the population average.

Looking at the results of the morbidity groups, they show that on average prior social care users are more likely to be included in a morbidity group. For all morbidity indicators except multiple year high somatic costs, the prevalence for social care users is at least twice as high. The outlier is the difference in prevalence for historic devices cost group, which is almost five times as high compared to the total population.

There are also differences in the distribution in SES groups. In the total population 41.33% of individuals belong to the low and lowest SES groups, while 78.57% of social care users belong to these groups. This means that only 21% of social care users belong to middle and high SES groups compared to 59% in the total population. These results suggest that social care users on average have a lower SES compared to the population.

Table 4*Descriptives of people who used social care in the previous year.*

Risk adjuster	Description	Population with use of social care in the previous year³	Total population²
Age	Age of individuals in 2023	65.77	42.33
DCG	Percentage of individual included in a diagnostic cost group	37.85%	11.90%
PCG	Percentage of individual included in a pharmacy cost group	70.21%	26.86%
MPC	Percentage of individuals included in a multiple year pharmacy costs	78.79%	30.30%
MHC	Percentage of individuals included in a multiple year high somatic costs	71.91%	43.77%
PPCG	Percentage of individual included in a psychological pharmacy cost group	16.51%	4.58%
PDCG	Percentage of individual included in a psychological diagnostic cost group	16.63%	5.11%
PMCG	Percentage of individuals included in a psychological multiple year high somatic costs	19.91%	7.90%
HDC	Percentage of individuals included a historic devices cost group	40.67%	8.34%
SES very low	Percentage if individuals with a very low socio economic status	60.40%	21.77%
SES low	Percentage if individuals with a low socio economic status	18.17%	19.56%
SES middle	Percentage if individuals with a middle socio economic status	13.96%	29.35%
SES high	Percentage if individuals with a high socio-economic status	7.46%	29.32%

²The averages are weighted by the fraction of the year that people were insured in 2023 and based on 17,792,868 observations.

³ The averages are weighted by the fraction of the year that people were insured in 2023 and based on 1,090,024 observations.

The results of step 1 indicate that social care users in the previous, on average have a higher age and worse health compared to the population average. This suggests higher healthcare costs for prior social care users.

4.2 Results step 2

This section presents the results: if prior social care use is associated with higher healthcare spending. The average healthcare costs of the total population are calculated and compared to the average healthcare costs of social care users.

Table 5 shows the results of the average costs. The weighted average healthcare costs of social care users are 11281 euros, which is more than 3,5 times larger than the population average of 2956 euros. Both somatic care and mental care costs are higher for prior social care users. But the out of pocket spending under the mandatory deductible are higher for social care users which decreases the difference in healthcare costs.

Table 5

Average costs under the basic healthcare package

Average costs ¹	Population ²	Social care users ²
Healthcare costs	2956.30	11281.31
Somatic care costs	2833.77	10232.22
Mental care costs	316.21	1388.44
Out of pocket spending	193.67	339.36

¹Average costs are based on healthcare expenditures in 2023.

²The averages are weighted by the fraction of the year that people were insured in 2023, based on 17,792,868 observations for the general population and 1,090,024 observations for social care users.

Results of the regression analysis show comparable results. The regression of equation 1 is used and the results are presented in table 6. Users of social care in the previous year on average have 8859 euros higher healthcare costs compared to the total population, ceteris paribus. These results are significantly different <0.01 for zero. The same can be said for both somatic care, mental care and out of pocket spending. Table 12 in the appendix shows the regression results per type of social care.

The R² values that can be obtained from the regression for healthcare costs is 0.0386. Indicating that prior use of social care explains a proportion of the variance in average healthcare costs. For the other costs social care use also explains part of the variance.

Table 6

Regression outcomes costs (y = average costs, x = yes/no of social care)

Costs ^{1,2}	Intercept	Regression coefficient ³	R ²
Healthcare costs	2421.81	8859.49**	0.0386
Somatic care costs	2358.77	7873.45**	0.0346
Mental care costs	247.37	1141.08**	0.0057
Out of pocket spending	184.32	155.04**	0.0432

¹Average costs are based on healthcare expenditures in 2023.

²The results are based on 17,792,868 observations.

³Regression coefficients are based on equation 1.

** p < .01

In table 7 average costs per type of social care is shown. The average healthcare costs for all types of social care are higher compared to the population average of 2956 euros. The types with the highest average healthcare costs (>15000) are type 11 (wheelchair), 13 (living arrangements), 14 (other tools) and 88 (other protected living and asylum). For these types of social care somatic costs explains most of the costs. The average mental care costs differ per type. Some types of social care have low average mental costs (<1000) like types 1 (help with chores), 5 (living service), 8 (transport services), 11 (wheelchair), 12 (transport arrangements), 13 (living arrangements) and 14 (other tools). While others have high average mental care costs (>5000) types 3 (personal care), 4 (short stay), 15 (being protected), 17 (emergency asylum) and 18 (other protected living and asylum). Average costs below mandatory deductible is in all types around the same amount.

Table 7

Average costs for every type of social care

Types of social care ^{1,2}	Healthcare costs ³	Somatic costs ³	Mental healthcare costs ³	Out of pocket spending ³
01	13201.01	12739.58	829.62	368.18
02	9350.62	5961.79	3702.04	313.20
03	11547.80	6510.93	5347.00	310.14
04	17874.34	11000.87	7208.34	334.87
05	14839.47	14332.21	859.00	351.74
06	10561.01	8731.03	2148.12	318.14
07	12799.71	9025.73	4112.89	338.91
08	12470.04	11888.21	928.38	346.55
09				
10	11297.87	9122.09	2511.95	336.18
11	19463.39	19253.72	549.20	339.52
12	12674.73	12334.55	684.30	344.12
13	18369.39	18217.63	510.17	358.42
14	19513.24	19190.40	653.45	330.61
15	13236.50	3444.23	10103.75	311.48
16	6299.59	3322.54	3233.48	256.42
17	9411.55	3675.72	6003.61	267.78
18	13230.23	3790.23	9744.38	304.38
19	18210.21	17053.52	1489.72	333.03

¹Variable numbers refer to social care types listed in Table 3.

²The results are based on 17,792,868 observations.

³Average costs are based on healthcare expenditures in 2023.

The results of step 2 indicate that prior social care users on average have higher healthcare costs compared to the population average. These findings may also suggest higher residual healthcare costs for social care users in the previous year.

4.3 Results step 3

This step presents the results for the association of prior social care use with higher residual healthcare spending. Table 8 shows the average residual healthcare of the total population “is zero” indicating that the risk equalization model “accurately” predicts healthcare costs. The same is true for somatic care, mental care and out of pocket spending. This is because the model is defined such that the total predicted costs add up to the total actual costs.

For social care users in the previous year it is a different story. Residual healthcare costs are on average -270 euros. This means that the predicted healthcare costs based on the risk equalization model are on average 270 euros lower than the actual healthcare costs for social care users. The residual healthcare costs are negative because somatic and mental care costs for social care users in the previous year are on average undercompensated. Out of pocket costs under the mandatory deductible is overcompensated for, decreasing the negative residual healthcare costs.

Table 8

Average residual costs¹ under the basic healthcare package

Average residual costs ²	Population average	Social care users average
Residual healthcare costs	0.00	-270.48
Residual somatic care costs	0.00	-271.91
Residual mental care costs	0.00	-21.66
Residual out of pocket spending	0.00	23.09

¹Residual costs mean expected cost minus the actual costs.

²The averages are weighted by the fraction of the year that people were insured in 2023, based on 17,792,868 observations for the general population and 1,090,024 observations for social care users.

The results of equation 3 are presented in table 9. Use of social care in the previous year on average decreases the residual healthcare costs with 288 euro, ceteris paribus. This is caused by on average under compensation of 289 euros for residual somatic care costs, and 23 euro mental care costs. Residual costs for out of pocket spending on average is overcompensated for with 25 euros for prior social care users. These results indicate that social care users in the previous year are predicably making losses for insurers. Table 13 in the appendix shows the regression results per type of social care.

Although the regression coefficients are statistically significant, the R² values are low, ranging from 0 to 0.0023. Compared to the R² results in table 6, the current risk equalization model already picks up most of the variance.

Table 9

Regression outcomes residual costs (yres = average residual costs, x = use of social care)

Residual costs ^{1,2}	Intercept	Regression coefficient ³	R2
Residual healthcare costs	17.37	-287.84**	0.0001
Residual somatic care costs	17.46	-289.37**	0.0001
Residual mental care costs	1.39	-23.05**	0.0000
Residual out of pocket spending	1.48	24.57**	0.0023

¹ Residual costs mean expected costs minus the actual costs.

²The averages are weighted by the fraction of the year that people were insured in 2023, based on 17,792,868 observations for the general population and 1,090,024 observations for social care users.

³Regression coefficients are based on equation 3.

** p < .01

Table 10 presents the average residual costs per type of social care. For most types of social care, the average residual healthcare costs are negative meaning that the model undercompensates the healthcare costs. The average residuals healthcare costs differ per types of social care. Only for type 7 (daytime activities) is the average residual cost positive. For the other types of social care, the average residual costs are negative. This ranges from -100 euros to -2500 euros. The average residual healthcare costs are mostly caused by the residual somatic cost. Only for type 7 (daytime activities) and 19 (generic allocation) are the average residual somatic costs positive. For average residual mental care costs there are larger differences. Some types of social care have positive residual mental costs like types 5 (living services), 8 (transport activities), 11 (wheelchair), 12 (transport arrangements), 13 (living arrangements) and 14 (other tools). While other types of social care have on average residual mental care cost are negative. This explains why the average residual costs of mental care are lower than somatic costs. The average residual out of pocket spending are all positive and differ only slightly, ranging from 19 to 42 euros.

Table 10
Average residual costs for every type of social care

Types of social care ²	Healthcare costs ¹	Somatic costs ¹	Mental care costs ¹	Out of pocket spending ¹
01	-282.81	-299.11	-12.00	28.31
02	-267.91	-73.46	-220.72	26.27
03	-675.80	-346.24	-358.17	28.61
04	-1697.43	-216.22	-1510.94	29.74
05	-506.76	-641.06	105.27	29.03
06	-1034.05	-971.84	-89.69	27.48
07	374.34	575.10	-219.94	19.18
08	-125.50	-208.29	63.60	19.19
09				
10	-250.18	-200.41	-77.63	27.87
11	-959.21	-1091.86	108.96	23.69
12	-310.56	-406.93	75.27	21.10
13	-1137.28	-1260.77	96.35	27.13
14	-1499.01	-1635.74	111.62	25.11
15	-873.19	-111.98	-804.07	42.85
16	-585.66	-199.02	-398.45	11.80
17	-2582.16	-868.92	-1742.20	28.96
18	-1183.05	-239.28	-978.60	34.84
88	-102.65	93.51	-219.83	23.67

¹Average costs are based on healthcare expenditures in 2023.

²Variable numbers refer to social care types listed in Table 3.

The results of step 3 indicate that individuals who use social care in the previous year are undercompensated for in the current risk equalization model. Compared to the average healthcare costs calculated in step 2, the model compensates a large amount of the extra costs. Although the R^2 is small, the under compensation on average is still statistically significant.

4.4 Results step 4

This final step of the results chapter answers the fourth sub question about appropriateness of use of social care in the previous year as a risk adjuster in the risk equalization model. Based on the WOR 1234 assessment framework four criteria are defined. Equalization performance, efficiency of incentives, manageable complexity and validity, measurability and stability. In table 11 these criteria are shown and how use of social care in the previous year performs.

Table 11

Performance of use of social care in previous year as a risk adjuster.

Criteria	Performance
Equalization performance	+
Efficiency incentives	+
Complexity	-
Validity	-
Measurability	-
Stability	?

Incorporating the prior use of social care would have a positive impact on the risk equalization performance of the model. Individuals who used social care in the previous year on average are undercompensated for with 270 euros. This violates the principle of equal playing field because this puts insurers with a large population of social care users at a disadvantage. By incorporating prior use of social care into the risk equalization model it removes this disadvantage, equalizing the playing field.

Including social care in the previous year as a risk adjuster also has a positive impact on incentives for efficiency. Because insurance companies are more likely to improve healthcare for social care users. In the current model insurers have a financial disincentive to improve quality of care for social care users because they are undercompensated. Proper compensation of healthcare costs of social care users improves the incentive for health insurers to provide good quality of care for them.

A concern most of the time with efficiency incentives is that adding a risk adjuster creates incentives for insurers for inefficient behaviour. But prior use of year social care does not introduce these unintended effects, because social care is organized by municipalities rather than insurers. The ability of health insurance companies to influence social care use is limited. Health insurance companies cannot influence who receives social care because it is financed through the government (*gemeentefonds*). Because of this the incentive for efficiency remains for health insurers (Ministerie van Volksgezondheid, Welzijn en Sport, 2016).

Adding social care as a risk adjuster would increase the complexity of the model, as it requires data linkage between different datasets. This introduces extra steps and could increase the risk of errors.

The final criterion of validity, measurability and stability are a crucial part of the framework. Only if prior use of social care meets these three conditions can it be considered as appropriate. Validity is likely to be met since the results in table 9 show that social care use in the previous year is associated with higher residual healthcare spending ($P < 0.001$). This is true for somatic care, mental care and out of pocket spending. However, a concern is that municipalities differ in their assessment and allocation of social care. Since eligibility is determined by municipalities, the variable may not be fully independent of the behaviour (Oosterhoff et al., 2025).

Use of social care in the previous year does not meet the criterion of measurability. A key requirement for measurability is that data must be available nationwide. However, municipalities are free to choose if send their data and allow the data to be publicly available. Because of this only 94% of municipalities send their data to the central bureau of statistics. It must therefore be considered that it is an underestimate of the total amount of social care users (CBS, 2026a). If this underestimation influences the average residual healthcare costs of social care users is unknown.

The stability of prior social care as a risk adjuster unknown. This thesis only looks at the healthcare costs of the year 2023. For a risk adjuster to be stable it must remain predictive over time. Further research can control for year-on-year stability of the criterion be demonstrated.

The results of step 4 indicate that implementation of prior use of social care as a risk adjuster in the risk equalization model does lead to an improvement in equalization performance and efficiency incentives. But it does not meet the criteria of validity, measurability and stability in its current form where municipalities are responsible for social care.

5. Discussion and conclusion

In this final part of the thesis an answer to the research question is provided. This is done by giving answer to the four sub questions. Also the strengths, limitations and implications for future research of this thesis are discussed. What the policy implications are and finally what conclusions can be drawn from this thesis.

5.1 Answer to the research question

This thesis answered the question whether the prior use of social care (Wmo 2015) as a risk adjuster, can improve the Dutch risk equalization system. The central research question was: *What are the possibilities and effects of improving the Dutch risk equalization system with risk adjusters based on prior use of social care?*

The results of step one show that individuals who made use of social care in 2022 are older, more often belong to morbidity group and have a lower SES on average compared to the population average. The descriptive statistics indicate that the healthcare costs for prior social care users are higher.

Step two showed that social care users in the previous year on average have higher healthcare spending compared to the average population (11281 euros vs 2956 euros). This is because both somatic care and mental care costs are higher for prior social care users. The difference slightly decreases because out-of-pocket spending under the mandatory deductible on average is higher for prior social care users. The regression analysis of equation 1 shows that prior social care users also have higher healthcare costs. All the different types of social care have higher healthcare costs on average compared to average healthcare costs of the total population. But there are differences in costs between the type of social care. For some types the healthcare costs are mostly caused by somatic care costs. While for other types are mostly caused of mental care costs.

Results of step three showed that after risk equalization, under compensation of 270 euros on average remain for prior social users. This is because the actual costs for somatic care and mental care costs are higher than expected costs of the current model. The out of pocket spending is positive, bringing the residual healthcare costs closer to zero. This under compensation creates incentives for risk selection.

The results from equation 3 show that prior use of social care is associated with a decrease in residual healthcare costs of 287.84 euros ($P < 0.01$). This indicates that social care users are creating predictable losses for insurers. When comparing residual healthcare costs for different types of social care, the results differ. Social care type 7 (daytime activities) is the only type with higher predicted than actual costs. All other types of social care indicate under compensation ranging from 103 to 2582. For most types of social care, the bulk of the residual costs is by the under compensation of somatic care.

The results so far suggest that adding prior social care use to the model would reduce under compensation for this group and reduce selection incentives for health insurers. The R^2 of the regression before and after risk adjustment are compared. This can gives an indication

of the potential of adding prior social care use as a risk adjuster. The R^2 on healthcare costs before risk adjustment is 0.0386. After risk equalization the R^2 of healthcare costs drops down 0.0001. This indicates that a large part of the equalization effect is already picked up in the current model and its existing risk adjusters. But like stated by Van de Ven & Van Kleef (2024) the R^2 is not always a good indicator. The R^2 does not account for the under compensation for social care users in the previous year. And because it is still of added value in reducing selection incentives it would be considered an improvement for the model.

The fourth step assessed whether prior social care use meets the formal criteria of the WOR assessment framework (VWS, 2024). adding prior use of social care as risk adjuster to the equalization model it would improve its equalizing performance. It would also remove the financial disincentive for insurers to improve quality of care for social care users.

But the criteria of manageable complexity, validity, measurability and stability are of concern. Implementing previous use of social care into the model would increase its complexity. On one hand validity is supported by the results and aligns with existing literature. But on the other hand, municipalities differ in assessments of social care. This makes it so that receiving social care is not objectively measured but differs per municipality. Measurability poses as an obstacle because municipalities are responsible for carrying out social care. They get to choose whether they want to share their data and as a result only 94% of municipalities share their data. The amount of social care users is underestimate of the total number. Based on the results of this thesis the stability of prior use of social care is unknown.

This thesis is academically relevant because including a risk adjuster based on prior use of social care has not been researched yet. The results of this thesis show that including it has potential to improve the risk equalization model.

5.2 Strengths, limitations & directions for future research

What makes this thesis strong is that the data used is the national risk equalization data. In the environment of CBS, the actual healthcare costs of 17,792,868 insured individuals in 2023 are included. The predicted healthcare, somatic care, mental care and out of pocket spending are based on the actual risk equalization model used in 2026.

Based on the results of this thesis the stability of prior social care use is unknown. This assessment is done for only one year does not assess the stability over time. This can be an interesting direction for future research. For some type of social care there are a small number of individuals who make use of them. Type 17 and type 19 only have a few hundred users. For these groups, the average costs might be different in other years. But for the main results of this thesis data from 17,792,868 individuals and 1,090,024 social care users are included. Average healthcare costs for these groups in other years are likely to be the same.

A limitation of this study which makes the current form of prior use of social care unfit as a risk adjuster is measurability. A risk adjuster is measurable if the data is available nationwide. But currently the municipalities can choose independently to send their data on social care use. In 2022, 94% of the municipalities chose to send their data (CBS, 2026a). This means that the current amount of social care users an underestimation is of the actual users. The results of this thesis might have been different if the data would have been available for all social care users. Future research is needed to find a way to collect the data from municipalities who currently do not provide data on social care users.

An interesting direction for future research could be to calculate the benefits, disadvantages, and effects of a risk adjuster based on social care use in the current year. In this thesis the standard practice of basing health indicators on information from the previous year was followed. Usually, health indicators are based on use in the previous year to prevent gaming from health insurers (Van De Ven et al., 2022). However, it might be interesting here to use information from the current year because health insurers do not control who receives social care. The municipalities decide who receive social care, so health insurers are not able to incentivize upcoding. The reason why use of social care in current year could align better with actual healthcare costs, is because you use current instead of potentially outdated information where social care is no longer used or is used but not accounted for.

5.3 Policy implications

Despite the limitations, the results of this study offer several relevant insights for policymakers and researchers. Implications can be made based on the under/overcompensation of social care users in the previous year. And what effects the results of this thesis have on the design of the risk equalization model

The results show that on average social care users in the previous year generate predictable losses for insurers in the current model. This creates an unequal playing field because insurers with a high proportion of social care users are at a financial disadvantage. The under compensation creates incentives for quality skimping. This decreases the quality of

care for social care users who are already vulnerable. That is why it is important for the Dutch Ministry of Health to consider prior social care use as a potential risk adjuster.

One major flaw of prior use of social care does not meet the criterion of measurability. This makes it so in its current form it is not acceptable as a risk adjuster. For it to become acceptable it would need to become nationally available which a national institute like the ministry or the CBS would be responsible for collecting the data from municipalities who currently do not provide the data. Also, the registration differs per municipality which means that a standardised uniform registration is needed before it can be implemented as a risk adjuster.

5.4 Conclusion

This thesis investigated if use of social care in the previous year can serve as a risk adjuster to improve the Dutch risk equalization system. The results conclude that social care users in the prior year are significantly older, are more often included in morbidity groups, and have higher healthcare costs than the total population. In addition, the current risk equalization model undercompensates insurers for this group by 270 euros on average, creating incentives of risk selection for insurance companies.

Prior social care use satisfies the criteria of equalizing performance and efficiency incentives. However, because municipalities are responsible for the implementation of social care validity and measurability currently present as obstacles.

In conclusion, prior use of social care shows that it does have potential to improve the Dutch risk equalization system, but implementation requires improvements before it can be included into the model.

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7. Appendix

Table 12

Regression outcomes *average* costs ($y = \text{average costs}$, $x = \text{type of social care}$)

Explanatory variable ¹	Regression coefficient ^{2,3}			
	Healthcare costs	Somatic costs	Mental healthcare costs	Copayment costs
01	6522.36**	6515.86**	130.30**	-123.81**
02	2791.21**	94.45**	2761.96**	-65.20**
03	1789.66**	524.07**	1261.07**	4.52
04	7048.59**	2739.78**	4340.09**	-31.28**
05	4054.3**	3897.02**	210.21**	-52.92**
06	2838.83**	2028.38**	865.02**	-54.57**
07	2388.49**	103.86*	2302.34**	-17.77**
08	3307.25**	3517.37**	-143.83**	-66.29**
09				
10	4195.52**	2736.55**	1543.65**	-84.68**
11	8389.02**	8469.52**	-54.55**	-25.95**
12	4619.51**	4622.68**	85.00**	-88.18**
13	6153.63**	6395.47**	-208.93**	-32.92**
14	3919.9**	3943.74**	-34.76	10.91**
15	8770.95**	122.22*	8739.23**	-46.14**
16	2143.4**	153.94	2035.59**	-46.14**
17	4201.48**	922.84	3321.76**	-43.13**
18	4759.23**	268.33	4528.53**	-37.63**
19	8611.15**	8030.31**	619.17**	-38.34**
Constant	2463.61**	2393.80**	255.70**	-185.89**

¹Variable numbers refer to social care types listed in Table 3.

²Regression coefficients are based on equation 2.

³The averages are weighted by the fraction of the year that people were insured in 2023, based on 17,792,868 observations for the general population and 1,090,024 observations for social care users.

*P < .05

**P < .01

Values without asterisk are not significant (P > .05)

Table 13

Regression outcomes **average** costs ($y = \text{average costs}$, $x = \text{type of social care}$)

Explanatory variable ¹	Regression coefficient ^{2,3}			
	Healthcare costs	Somatic costs	Mental healthcare costs	Copayment costs
01	-130.43**	-114.19**	-37.64**	21.40**
02	-226.82**	-58.96**	-185.82**	17.96**
03	-375.45*	-271.76	-105.31	1.61
04	-1527.01**	-162.48	-1375.06**	10.53**
05	-140.36	-219.01*	65.63	13.02**
06	-811.42**	-785.86**	-40.13	14.57**
07	669.68**	831.64**	-159.09**	-2.87**
08	49.50*	-48.40*	92.86**	5.04**
09				
10	-74.02*	-33.38	-59.01**	18.37**
11	-541.06**	-600.70**	53.57**	6.07**
12	-37.54*	-132.68**	85.31**	9.83**
13	-893.59**	-951.86**	50.66**	7.61**
14	-819.76**	-862.43**	40.51	2.16
15	-848.95**	-158.99**	-727.12**	37.16**
16	-568.70**	-246.54*	-330.10**	7.94**
17	-2405.20**	-873.14	-1550.68**	18.61*
18	-772.63**	-199.51	-584.85**	11.72**
19	177.49	403.37	-233.93	8.06
Constant	16.70**	16.69**	1.28	-1.27**

¹Variable numbers refer to social care types listed in Table 3.

²Regression coefficients are based on equation 4.

³The averages are weighted by the fraction of the year that people were insured in 2023, based on 17,792,868 observations for the general population and 1,090,024 observations for social care users.

*P < .05

**P < .01

Values without asterisk are not significant (P > .05)