Risky business:
Dutch deductible dilemma

A societal cost benefit analysis of changes in the deductibles within the Dutch health insurance act

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Acknowledgement

Authoring this thesis has been a valuable and challenging experience, stemming from my interest in the complex dynamics of the Dutch healthcare system and the social impact of policies. My academic background in Complex System Engineering and Management and my involvement in courses such as TB242TB Improving the Transportation System and TPM037A Health Systems have inspired me to apply the SCBA method within the healthcare domain. Driven by the desire to research a current and socially relevant topic, I set out to find an issue at the policy level where SCBA and healthcare converge.

The target audience for this thesis consists of policy makers, researchers and other professionals involved in healthcare and policy development. With this thesis, I hope to offer them valuable insights into the effects of different policy scenarios surrounding the deductible to contribute to informed decisions in the future.

For authoring this thesis, I had the opportunity to do an internship at Berenschot. I would like to thank Rosanne for her guidance during my internship. Her expertise and support helped me tremendously in bringing my research to a successful conclusion.

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Abstract

Situation

In the Netherlands, the deductible is an essential part of the healthcare system, designed to regulate healthcare usage and keep healthcare costs manageable. The current deductible is €385 per year, but there are growing concerns about the accessibility of care for vulnerable groups such as chronic healthcare users and care avoiders. These concerns have led to political debates and policy proposals to revise the deductible. The Dutch government is set to adjust the deductible in 2027, spreading the cost over multiple treatments, €50 per treatment with an annual maximum of €165. While these adjustments are intended to increase access to care, little is yet known about the broader social impact of such changes to the deductible.

Complication (Question)

The central question of this thesis is: "*What are the social costs and benefits of the policy change in the Dutch deductible to €50 per treatment with an annual maximum of €165, compared to the current system, for the entire Dutch society over the period 2027-2070?*"

Approach

To answer this question, a Social Cost-Benefit Analysis (SCBA) was conducted to evaluate the social impact of four policy options: elimination of the deductible, reduction to €50, reduction to €165, and the Spread scenario. The SCBA looked at both quantified and monetized impacts, including the benefits of accessibility through perceived cheaper care, increased costs of nominal premiums and income-dependent contributions through changes in healthcare usage, costs, and health benefits. The analysis period was from 2027 to 2070 and took into account uncertainty factors such as population growth and price elasticity of health care demand. Sensitivity and uncertainty analyses were conducted to evaluate the robustness of the results, and critical assessments were made of the assumptions underlying the model.

Results

The analysis showed that all four scenarios result in a negative Net Present Value (NPV), indicating that costs exceed benefits over the entire period of analysis. The Spread scenario resulted in a total NPV of -€194 billion, with an average annual NPV of -€4.41 billion with extremes values -€4.92 billion and -€2.56 billion. These results suggest that the social costs, mainly caused by higher nominal premiums and income-related contributions, significantly exceed the expected benefits, such as reduced spending on deductibles and health benefits from improved access to care.

In addition, the results show that the intended financial threshold of the Spread scenario may not be effective in reducing healthcare usage. The analysis indicates that total costs for healthcare users under this scenario are often lower than under the current situation, even after multiple treatments. This implies that the lower cost per treatment may actually encourage rather than inhibit healthcare usage, leading to higher healthcare usage, longer waiting times for care, quality reduction in care, and higher costs to society.

At the individual level, we are talking about an average annual NPV of €275 per person. But this includes an increase in nominal premium and income dependent contribution of €452.90 plus the cost of the deductible. This will increase nominal premium more than the deductible will

decrease. Society's solidarity will be greatly called upon, because the difference between payments for healthcare users and non-healthcare users will be significantly reduced, while the cost of the nominal premium will increase by 26%.

Next Steps

The study contained several assumptions that require further research to reduce uncertainties. It is recommended that follow-up research be conducted on detailed demographic analyses to better understand societal responses to policy. Furthermore, it is important to identify the long-term effects of early disease interventions to better estimate future care needs. In addition, it is crucial to reconsider the current policy proposal and conduct extensive research on its potential effects to ensure that policy goals are achieved without undermining solidarity.

The findings of this thesis contribute to the broader debate on the future of the Dutch healthcare system by emphasizing that policy choices around the deductible should not only be financially feasible, but also fairly and sustainably aligned with the fundamental values of solidarity and accessibility in healthcare.

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Chapter 1: Introduction

1.1 Problem introduction

At the core of the Dutch health insurance system is a complex but crucial element: the deductible. The healthcare system is based on the principle of solidarity, where everyone contributes to healthcare costs so that everyone has access to necessary care. However, the deductible partially challenges this principle, as individuals must first pay a portion of their healthcare costs themselves.

The current deductible was introduced in 2006 with the Health Insurance Act (Zvw) (Zorgwijzer, 2023). The previous system consisted of the Health Insurance Act for those with lower incomes and private insurance for those with higher incomes. This made the health care system fragmented and sometimes difficult to understand for the average person. The introduction of the Health Insurance Act aimed to create a more uniform and transparent system in which all residents of the Netherlands were required to have basic insurance with a private insurer. The introduction of the deductible has significantly affected the way the Dutch consume and pay for health care (*Verschillen Vorige en Huidige Stelsel*, z.d.).

Since 2006, the deductible has been adjusted several times, with the current amount set by the government at €385 (Ministerie van Algemene Zaken, 2023). All persons aged eighteen and older must pay this amount annually before their healthcare costs are reimbursed by the insurer. The idea behind this is that a fixed, predetermined amount makes people more aware of their healthcare expenses and helps control healthcare costs.

Now the Dutch healthcare system is once again on the eve of a major policy change regarding the deductible, which could fundamentally change the healthcare system. This issue was at the center of the 2023 elections to the House of Representatives and led to extensive debates and discussions (StemWijzer | Tweede Kamerverkiezing 2023, 2023). Now, in 2024, after the elections, the new coalition agreement has been worked on, with substantial reforms to revise the deductible: from annual €385 to €165, paying €50 per treatment. This agreement forms the basis for policy changes that could be implemented in 2025 (NIS, 2024).

This study, entitled “Risky Business: The Dutch Deductible Dilemma - An SCBA Analysis of Changes in the Deductibles within the Dutch Health Insurance Act,” examines the current situation and potential future of deductibles. It examines not only the direct consequences for health-seeking individuals, but also the broader social implications for the Dutch health care system and society. Using a Social Cost Benefit Analysis (SCBA), this research aims to clarify the possible outcomes of the proposed policy change. The findings are essential for shaping fair and effective health care policies that meet the needs of all Dutch citizens.

1.2 Relevance

1.2.1 Scientific relevance

This research contributes to the existing literature on the social impact of healthcare policies, with a focus on the deductible within the Dutch Health Insurance Act. Although much research has explored the economic effects of healthcare usage and cost-sharing, the broader impact on social welfare, particularly in the context of deductible policy changes, is understudied. Notably, there is no research on specific changes like reducing the deductible and paying per treatment. This study addresses this gap by using a SCBA to evaluate the social, economic, and health-related impacts of different policy options.

Existing studies primarily focus on how financial incentives like deductibles influence healthcare utilization, expenditures, and access. However, a significant knowledge gap exists regarding the broader societal impact, including effects on vulnerable groups and long-term outcomes such as prevention, early intervention, and public health.

By conducting an SCBA, this research provides a comprehensive assessment of the direct and indirect costs and benefits of altering the deductible. This approach aims to determine not only the economic efficiency of these policy changes but also whether the potential benefits, such as improved accessibility and equity in care, justify the costs involved.

1.2.2 Societal relevance

The proposed changes to the deductible within the Dutch Health Insurance Act are at the center of an important political debate. There is growing concern that the current deductible system may discourage people from seeking necessary medical care, leading to adverse health outcomes and broader societal consequences. This study aims to explore these concerns by examining the societal impact of changing or eliminating the deductible.

By focusing on societal consequences, this study seeks to understand how changes to the deductible may affect healthcare accessibility. It examines whether removing financial barriers can lead to better health outcomes and greater equity in access to healthcare, and its broader impact on society.

1.2.3 CoSEM relevance

The essence of a CoSEM (Complex Systems Engineering and Management) thesis is to integrate multidisciplinary knowledge in the design of socio-technical systems for effective interventions. This thesis, focused on the reform of the deductible in Dutch health insurance, embodies the core principles of CoSEM through the following aspects:

- **Multidisciplinary:** The thesis combines knowledge from systems engineering, economics, and organizational sciences to analyze and address a complex societal challenge - the accessibility and affordability of healthcare.
- **Complex problem solving:** The focus is on dissecting a complex issue within a highly intertwined social and technical context, namely the Dutch healthcare system.

- **Societal approach:** The thesis recognizes the broad societal implications of healthcare policy and aims to provide insights that contribute to a more equitable and accessible healthcare system, focusing on the needs and rights of citizens.
- **Scientific approach:** The thesis approaches the issue from a scientific perspective, applying existing theories and developing new insights through a Social Cost Benefit Analysis (SCBA).
- **Reflection and Judgement:** In-depth consideration is given to the social and ethical implications of reform policies, with a particular focus on the impact on vulnerable groups in society.

These elements, in line with the CoSEM Final Attainment Levels, make this thesis not only relevant to the CoSEM program, but also contribute to the development of intervention strategies in real decision-making processes within the complex field of healthcare policy.

1.3 Problem

1.3.1 Problem statement

The 2023 parliamentary elections have concluded, resulting in a new coalition agreement that outlines significant healthcare reforms. Central to these proposed reforms is the potential alteration or abolition of the healthcare deductible, scheduled for implementation in 2025.

However, the specific effects of this policy change remain unclear, raising important questions about its societal impact. This study aims to explore these uncertainties by conducting a SCBA to identify and weigh the impacts of the proposed policy change on society.

1.3.2 Objective

The objective of this thesis is to conduct a thorough SCBA to examine the proposed changes to the Netherlands' own risk policy. Building on the context and problem definition, this analysis aims to systematically identify, qualify, and quantify the potential effects of the policy change.

1.3.3 Research question

Following the identification of a significant scientific and societal relevance in section 1.2 Relevance, this next section pivots towards formulating a targeted inquiry aimed at understanding the implications of policy adjustments to the deductible within the Dutch healthcare system.

The main research question aims to explore the effects of changes to the deductible policy on Dutch society. To address this, the study examines a series of sub-questions that investigate the dynamics of the Dutch healthcare system, and the policy landscape related to the deductible. These sub-questions will also consider the reactions of key stakeholders to policy changes and the resulting healthcare and financial outcomes. This structured approach helps to understand the broader societal impacts of altering the deductible, thereby filling the existing knowledge gap, and supporting informed policymaking.

Therefore, the following research question is formulated:
What are the social costs and benefits of the policy change in the Dutch deductible to €50 per treatment with an annual maximum of €165, compared to the current system, for the entire Dutch society over the period 2027-2070?

Sub-questions:

1. What characterizes the structure and functionality of the healthcare infrastructure in the Netherlands?
2. What are the financial flows within the healthcare system, with a special focus on the role of the deductible in this system?
3. What does the policy change regarding deductibles in the Dutch healthcare system entail?
4. How do the main actors respond to the policy change of the deductible?
5. What effect does the policy change of the deductible in Dutch healthcare have on Dutch society?

1.4 Research approach

1.4.1 Approach

In this study, an SCBA is used to evaluate various policy alternatives. The SCBA method involves qualifying the costs and benefits associated with the policy measure into effects and quantifying them in monetary terms. This standardization of units of measurement facilitates the comparison of disparate impacts and helps policymakers choose between different policy options.

The focus of this research is to analyze the social impacts of a policy shift within the health care sector, drawing parallels with SCBA studies conducted within the transportation sector. In both contexts, the consequences of policy changes are articulated through a framework that translates them into costs and benefits, measured in euros. These are then assessed using a cost-benefit analysis. These are then assessed using a cost-benefit comparison model, which is then subjected to sensitivity analyses for validation. The validated model serves as a tool for conducting policy analyses for different scenarios.

1.4.2 Data Sources and Collection

To gain a better understanding of the Dutch healthcare system, a conceptual model will be developed based on literature. This model will be used to qualify the effects, which will then be quantified using a SCBA. To gain insights for the conceptual model, both scientific and gray literature will be utilized. Key databases for scientific literature include Scopus and Google Scholar, while gray literature insights will be derived from government websites. For the quantification of figures in the SCBA, primarily open data sources will be used. Import sources to include are CBS (Statistics Netherlands) and Vektis Open Data.

This approach aims to bridge the knowledge gap and answer the research question, providing valuable insights in Dutch healthcare.

1.5 Overview of thesis structure

This thesis is structured to provide a comprehensive examination of the proposed policy changes to the deductible within the Dutch Health Insurance Act. The structure is designed to systematically explore the context, theoretical framework, methods, and findings of the study. The following is an overview of the chapters:

Chapter 1: Introduction: This chapter sets the stage for the thesis by introducing the problem, stating the objectives, and discussing societal relevance. It provides an overview of the current debate on the deductible system, outlines the research approach, and highlights the importance of the study.

Chapter 2: Theoretical framework: This chapter discusses the theoretical underpinnings of the research. It describes the current healthcare system in the Netherlands, including the Health Insurance Act and cash flows. The chapter also presents a conceptual model, discusses proposed policy changes, and examines the reactions of key stakeholders. The effects of reforms on various aspects of the healthcare system are also analyzed.

Chapter 3: Methods: This chapter describes the methodological approach of the study, focusing on the social cost-benefit analysis (SCBA). It explains how the SCBA is applied to quantify the effects of policy changes. The chapter describes the inputs, intermediate products and outputs of the model used for the analysis. Different scenarios are also discussed, including the base case and different reform options.

Chapter 4: Results: This chapter presents and discusses the findings of the SCBA. It offers an analysis of the impact of the proposed policy changes. The chapter compares the outcomes of different scenarios.

Chapter 5: Discussion: This chapter interprets the results within the broader context of the Dutch healthcare debate. It discusses the policy implications of the findings, emphasizing the potential challenges and benefits associated with the proposed reforms. The chapter also compares the study's findings with existing literature, discusses the strengths and limitations of the research, and suggests areas for future study.

Chapter 6: Conclusion: This chapter synthesizes the main findings of the study and their implications for the Dutch healthcare system. It provides a final assessment of the proposed policy changes, emphasizing the need for careful consideration of the financial and social impacts.

Chapter 7: References: This chapter lists all references cited in the thesis and provides a comprehensive bibliography of the sources used.

Chapter 8: Appendix: The Appendix contains additional material that supports the main text, such as detailed data tables, additional analyses, and technical notes on methodology.

Together, these chapters aim to provide a thorough and nuanced understanding of the potential impacts of deductible reform on the Dutch healthcare system and society.

Chapter 2: Theoretical framework

This chapter presents the theoretical framework necessary to understand the context and implications of changes to the deductible within the Dutch healthcare system. The aim of this chapter is to provide answers to the sub-questions of this research, offering an in-depth understanding of the healthcare system's structure, financial flows, responses of key actors, and the societal effects of policy changes.

The chapter is structured as follows:
2.1 Current Situation in the Health Insurance Act: This section describes the existing healthcare structure and financial mechanisms, focusing on the role of the deductible.
2.2 Conceptual Model: Introduces a conceptual model that visualizes the interactions within the healthcare system, particularly concerning the deductible, as a basis for analyzing policy impacts.
2.3 Policy Changes: Outlines the proposed changes to the deductible, including the rationale and intended objectives.
2.4 Actor Responses: Examines the expected reactions from key stakeholders to the policy changes regarding the deductible.
2.5 Conceptual Effects: Assesses the potential effects of the policy changes on healthcare and its utilization.
2.6 Conclusion: This section answers the sub-questions and sets the stage for the MKBA to be conducted in the next chapter.

By answering the sub-questions, this chapter lays a solid foundation for the SCBA to be applied in Chapter 3: Methods. The theoretical framework provided in this chapter is essential for the evaluation of the policy change's impact on society.

2.1 Current situation in Health Insurance Act

2.1.1 Core aspects of the Health Insurance Act

The Health Insurance Act, fundamental to the Dutch healthcare system, regulates compulsory health insurance for everyone living or working in the Netherlands. This law, introduced in 2006, replaced old systems of mutual health insurance and private health insurance with a uniform insurance system for both the public and private sectors (Zorginstituut Nederland, 2023).

The Dutch healthcare system is based on solidarity, where rich and poor, young, and old, healthy, and sick are all entitled to the same, affordable healthcare from the basic health insurance package. Everyone contributes to this through premiums and taxes. The Health Insurance Act reflects this social character through a number of important principles. (Zorginstituut Nederland & Ministerie van Volksgezondheid, Welzijn en Sport, 2023)

1. **Insurance obligation and basic benefit package:** Everyone living or working in the Netherlands is required by law to have basic health insurance. This insurance provides access to a government-determined basic benefit package of medical care, which is reviewed annually to ensure it meets the latest medical standards (Wetten.nl, 2023). People must pay to be insured, so non-healthcare users and healthcare users contribute to total healthcare.

From here all healthcare costs in the Netherlands are paid. This ensures that non-healthcare users help pay for care that they themselves do not use, but which is used by healthcare users.

2. **Acceptance obligation and prohibition of premium differentiation:** Health insurers are required to accept everyone for basic insurance, which means they must accept everyone regardless of age or health. There should be no premium differentiation based on health risks. Everyone pays the same premium for the same healthcare policy, regardless of their individual risk. This ensures that everyone has equal access to healthcare at the same cost (Wetten.nl, 2023).
3. **Mandatory and voluntary deductible:** The Netherlands has a mandatory deductible designed to promote cost awareness among policyholders. This deductible must first be met before health insurance will cover the costs, except for care such as doctor's visits that are exempt from it. In addition, policyholders have the option to choose a higher voluntary deductible (Wetten.nl, 2023). Taking this higher deductible allows the insured to pay a lower premium, but it also means they will have to pay more out of pocket when healthcare usage occurs. The voluntary deductible is beyond the scope of this study and is therefore not included in the analysis.

2.1.2 Actors within Health Insurance Act

This section explores in more detail the relationship between different actors within the Zvw framework and their roles, particularly with respect to the deductible.

Figure 2.1 provides a comprehensive overview of the Dutch healthcare system and highlights the interactions between the main actors within the Zvw framework. Appendix 8.2.1 includes a table; it elaborates on these actors and outlines their general role and specific relevance to deductibles.

As shown in figure 2.1, central to the healthcare system are the interactions between three main groups: providers, health insurers, and citizens. Here it is important to understand that citizens are the whole of society, meaning healthcare users and non-healthcare users. These interactions take place within markets specific to healthcare delivery, healthcare purchasing, and healthcare insurance:

- The healthcare purchasing market is illustrated by the arrow from "Providers" to "Health insurers," where health insurers procure medical services for their policyholders.
- The health insurance market is shown by the arrow from "Health insurers" to "Citizens," where individuals select insurance policies that provide access to necessary healthcare services.
- The health provision market is represented by the arrow from "Providers" to "Citizens," where patients directly receive healthcare from healthcare providers.

Figure 2.1 also highlights how health insurers implement the Health Insurance Act by purchasing care from healthcare providers within legal frameworks. The Netherlands Healthcare Authority oversees this market, while the Netherlands Healthcare Institute advises on the content of the basic benefit package and ensures care quality (Ministerie van Volksgezondheid, Welzijn en Sport, 2024).

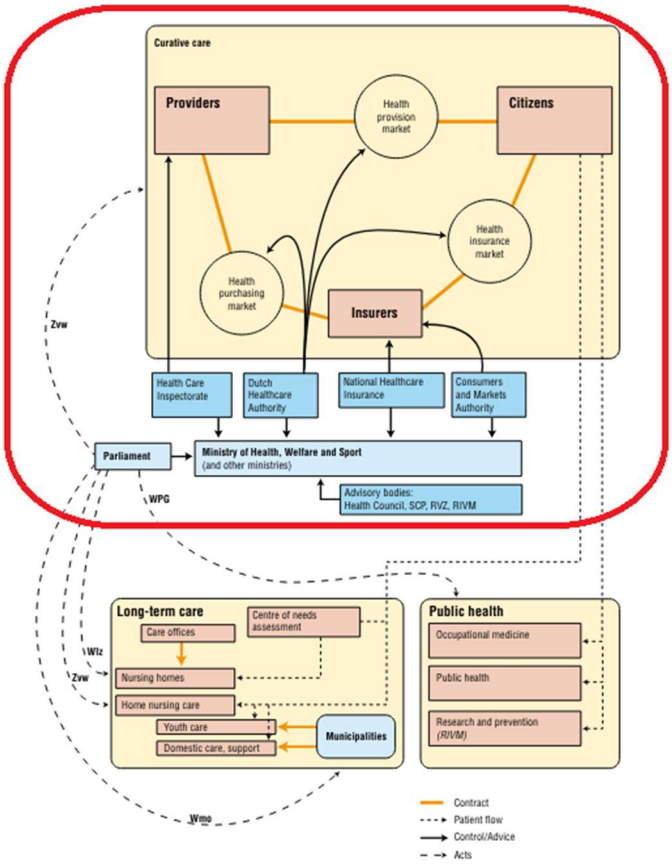

Figure 2.1: Organizational overview of the Dutch healthcare (Kroneman et al., 2016)

(A larger version of this image is included in Appendix 8.2.1)

2.1.3 Financial flows of the Health Insurance Act

To gain a comprehensive understanding of the Dutch healthcare system, it is essential to analyze how financial resources flow within the system, with particular attention to the role of the deductible. This analysis will help in understanding the origin and destination of financial resources, the impact of the deductible as a financial mechanism, and its effect on both healthcare providers and users.

The research question that will guide this analysis is: “How are financial flows within the healthcare system, with a special focus on the role of the deductible in this system?”

This question will be answered by examining the financial streams under the Health Insurance Act, identifying key actors and their linkages, and exploring the financial connections that sustain the system.

The Dutch healthcare system, under the Health Insurance Act, has a financing structure shown in figure 2.2. (Ministerie van Volksgezondheid, Welzijn en Sport, 2023; Ministerie van Financiën, 2015). It illustrates the structure, involving several key actors working together to support the system. The key actors and their financial connections are discussed below.

Detailed Description of Financial Flows

1. Citizens

A. Deductible and Nominal Premium: All citizens pay a nominal premium and a deductible (only if they use healthcare services) to health insurers.

B. Income-Dependent Contribution (IAB): Employers pay an income-dependent contribution to the Health Insurance Fund.

C. Taxes: Citizens and employers contribute taxes to the government, which are used to fund various healthcare-related expenses.

D. Healthcare Allowance: Low- and middle-income households receive a healthcare allowance from the government to help cover the nominal premium and deductible costs.

2. Health Insurers

A. Deductible and Nominal Premium: Health insurers receive the nominal premium and deductible payments from citizens.

E. Healthcare expenditures: Health insurers pay healthcare providers for the care they deliver to insured individuals.

F. Equalization Contribution: Health insurers receive an equalization contribution from the Health Insurance Fund, which considers the risk profile of the insured population and the deductible collected. This includes a government contribution for the administrative costs of insured children under eighteen, who do not pay premiums or deductibles. This ensures a level playing field among insurers, necessary due to the legal obligation for insurers to accept all applicants.

3. Health Insurance Fund

B. Income-Dependent Contribution: The Health Insurance Fund is financed by income-dependent contributions from employers.

H. Government Contribution: The government contributes to the Health Insurance Fund to ensure that children under eighteen do not pay a nominal premium and to support other healthcare expenses.

F. Equalization Contribution: The Health Insurance Fund compensates health insurers for loss of income due to non-payment of premiums and covers costs for uninsured individuals.

J. Availability Contribution: The Health Insurance Fund supports the financing of healthcare providers.

4. Government

H. Government Contribution: The government provides a contribution to the Health Insurance Fund to ensure that children under eighteen do not pay a nominal premium and to cover other necessary healthcare expenses.

D. Healthcare Allowance: The government provides healthcare allowances to low- and middle-income households to help cover the nominal premium and deductible costs.

C. Taxes: These allowances and contributions are funded through tax revenues collected from all citizens.

5. Healthcare Providers

E. Healthcare expenditures: Healthcare providers receive payments from health insurers for the care they provide to insured individuals.

J. Availability Contribution: The Health Insurance Fund supports the financing of healthcare providers.

Balance and Distribution

The Health Insurance Act mandates that healthcare financing must be equally split between income-dependent contributions (50%) and nominal premiums, deductible payments, and government contributions for children (50%). This 50/50 distribution ensures that any increase in healthcare expenses is proportionally shared between these financing sources, maintaining a balanced approach to funding the healthcare system. This requirement is established by law (Wetten.nl, 2023).

This structure ensures that all collective care expenditures are funded by citizens and businesses through various contributions and premiums, while the government helps make healthcare affordable for specific groups, such as children and low-income individuals.

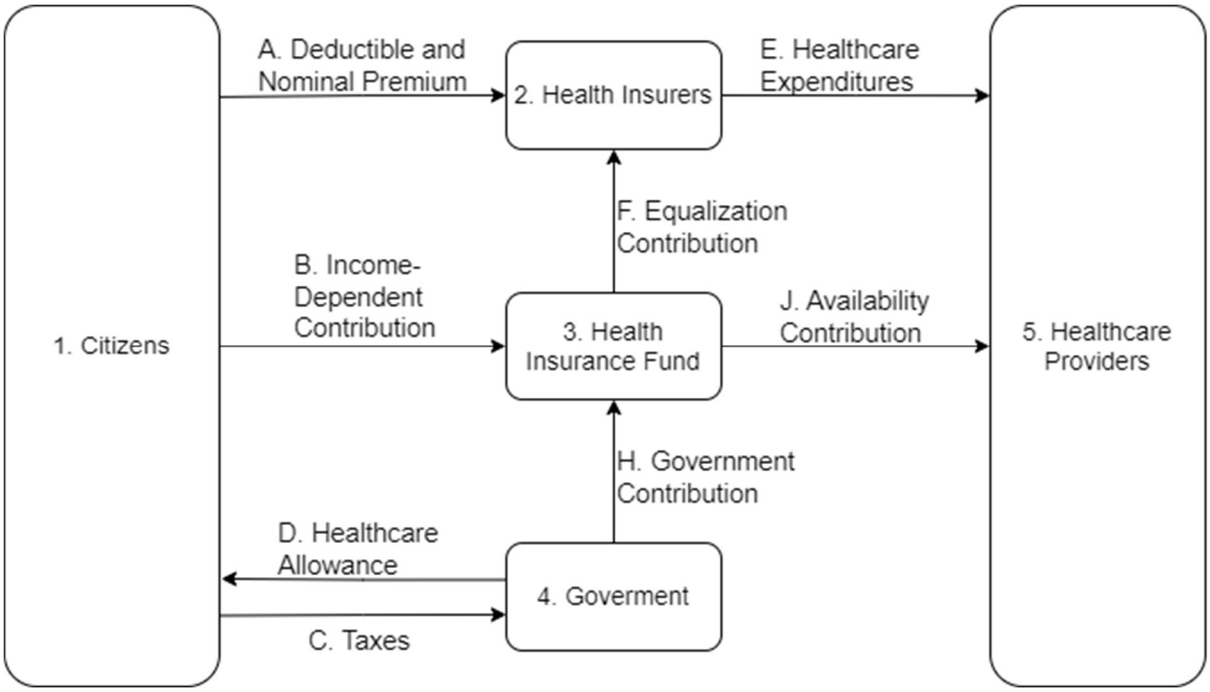

Figure 2.2: Structure of the Dutch Healthcare Financing System under the Health Insurance Act (Ministerie van Volksgezondheid, Welzijn en Sport, 2023; Ministerie van Financiën, 2015)

2.2 Conceptual model

This chapter introduces the conceptual model that illustrates the interactions surrounding the deductible within the Health Insurance Act. Earlier, in section 2.1.2, the main actors within the Health Insurance Act were discussed and an organizational overview was provided in figure 2.1. In addition, section 2.1.3 explained the financial flows within the healthcare system, as shown in figure 2.2. These figures form the basis for the conceptual model used in this thesis.

Figure 2.3 visualizes how supply and demand of healthcare usage and the financing of care by health insurers to healthcare providers take place. This conceptual model provides insight into the interconnections within the healthcare system and helps to understand how policy changes may affect healthcare users, healthcare providers and the financing of care. The numbers in the figure 2.3 correspond to references in the text, clearly explaining the various components of the model.

The conceptual model will be used to elaborate the changes for the main actors and to explain the effects of these changes. In addition, the model serves as a basis for the preparation of the SCBA, which evaluates the broader impact of the deductible on the healthcare system and society.

Explanation conceptual model

- **Society and healthcare users:** Society (1) is divided into two groups: healthcare users (1A) and non-healthcare users (1B). This division is crucial to better understand the dynamics of healthcare usage and the resulting demand for care. Demand for healthcare (2) arises from healthcare users and leads to healthcare usage (3). This use of healthcare directly results in health benefits (4) for society (1).
- **Healthcare providers and healthcare usage:** Healthcare usage (3) determines the amount of care to be provided by healthcare providers (5). These providers provide (6) the necessary care to meet the demand of healthcare users.
- **Financing Healthcare:** Health insurers (7) play a significant role in financing healthcare providers. They receive money through three main routes:
    - **Deductible (8):** This is an amount that healthcare users (1A) must pay themselves before the health insurer (7) begins reimbursing the healthcare provider (5). The deductible acts as a cost threshold and thus influences healthcare usage.
    - **Nominal premiums (9):** These premiums are paid by all members (1A+1B) of the society (1) to the health insurers (7).
    - **Equalization contribution (10):** This is a contribution from the health insurance fund (11), financed by an income-related contribution (12) from society (1). This income-related contribution is designed to share the financial burden based on income.
- **Healthcare expenditures and Healthcare providers:** Healthcare providers (5) receive money from health insurers (7) for the healthcare provided, which is referred to as healthcare expenditures (13). These expenses cover the costs associated with providing care to healthcare users.
- **Workforce:** As healthcare usage (3) grows, more supply (6) of healthcare providers (5) is needed. That means there does need to be enough capacity healthcare providers (14) for this, which provides the inflow of employees (15).

This conceptual model provides an overview of the interrelationships between the various components of the healthcare system and how the financing and delivery of healthcare are organized.

Care usage arises from society's need for care, distinguishing between healthcare users and non-healthcare users. Healthcare users create the demand for care, which care providers try to meet. These healthcare providers are paid by health insurance companies with money coming from both healthcare users and non-healthcare users.

Payments for healthcare consist of a nominal premium and an income-dependent contribution from both healthcare users and non-healthcare users, and a deductible paid only by healthcare users. These three cash flows converge at health insurers and must collectively cover the costs incurred so that health insurers can pay healthcare providers for the care provided.

This study therefore assumes that the whole of society contributes to the financing of healthcare usage through the nominal premium and income-dependent contribution. Revenue from the deductible, which comes only from healthcare users, is not considered a social contribution because it is not paid by non-healthcare users.

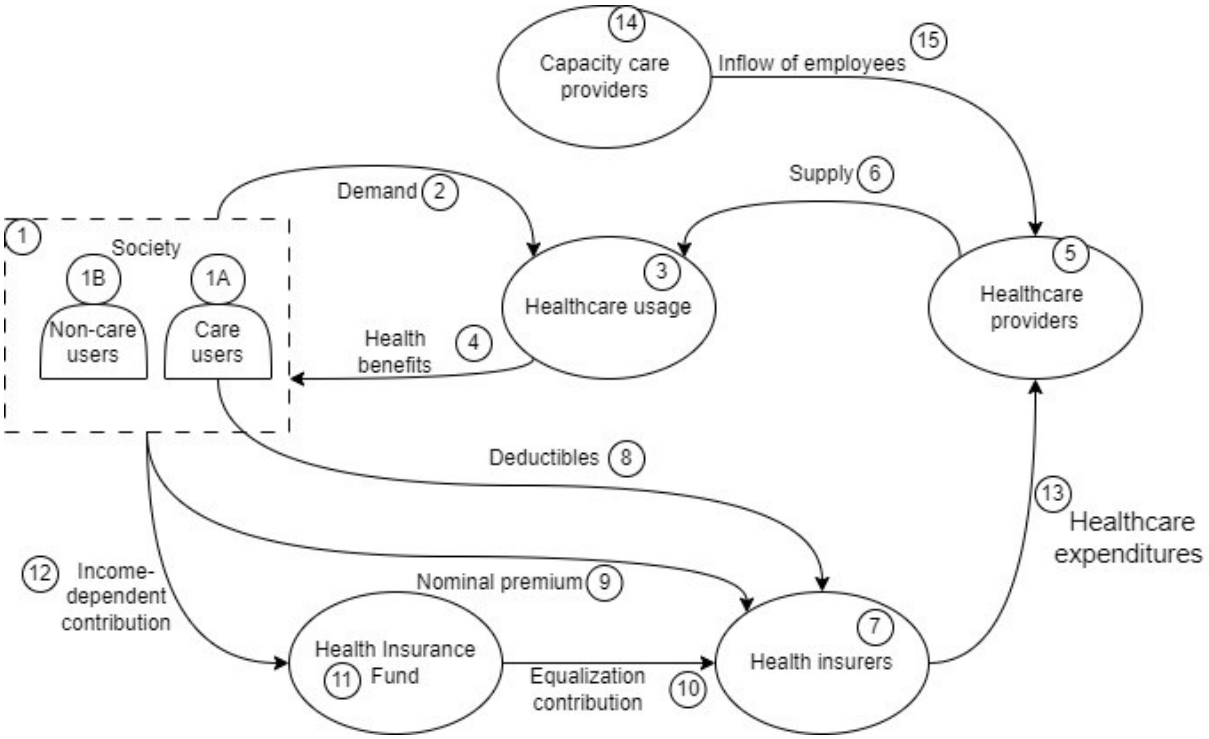

Figure 2.3: Conceptual Model on interaction in health insurance act

2.3 Policy changes

2.3.1 Political landscape

In January 2023, then Minister of Health, Welfare and Sport Ernst Kuipers wrote a letter to the House of Representatives outlining, in his words, "*de hoofdlijnen van een slimmere vormgeving van het eigen risico*"[1]. (Kuipers, 2023a) This involves information about spreading the deductible by paying €150 per treatment and an annual maximum of €385. In this way, the deductible is maintained, which contributes to the affordability of care, a small portion of the cost is placed on the healthcare user, to make people more cost-conscious, and to inhibit the use of non-emergency care. This will not affect long-term and chronically ill people because the annual maximum deductible remains at €385, but 1 million policyholders will pay less deductible on an annual basis. (Kuipers, 2023a)

In the end of 2023 Dutch House of Representatives elections prominently featured discussions around changes to the healthcare deductible. Various political parties presented distinct policy proposals, which were analyzed from their election programs by Kuijper (2023). These proposals highlight the spectrum of policy options under consideration for the deductible.

[1] Translation: the outline of a smarter design of the deductible

The key policy options discussed include:

- **Retention:** This option involves maintaining the current deductible system as it is, without any changes. Retention serves as a base case for comparing the impact and value of alternative proposals.
- **Abolition:** Abolishing the deductible means eliminating the deductibles. This approach aims to remove financial barriers to accessing healthcare services, ensuring that all costs covered by the basic benefit package are reimbursed from the first euro by the health insurer.
- **Reduction:** This policy option proposes lowering the deductible amount. This would decrease the financial burden on policyholders, encouraging more people to seek necessary medical treatments without hesitation due to high upfront costs.
- **Spread:** Spreading the deductible involves applying a limit to the amount an insured person must pay for each individual billable performance in healthcare and lowering the total annual deductible ceiling. This approach aims to apply the financial burden at more times when menses are considering healthcare usage, not just at the first time of healthcare usage, and in addition, it makes healthcare overall more accessible annually by making it more affordable.

By evaluating these options, it is possible to understand the potential benefits and drawbacks of each approach and determine the most effective policy for achieving the desired outcomes in the Dutch healthcare system.

Following the election results, a motion to abolish the deductible was introduced on December 13, 2023 (Dijk & Ouwehand, 2023) and on December 22, 2023, Ernst Kuipers responds to this motion through a letter. (Kuipers, 2023) Kuipers indicates that abolishing the deductible will cost the Dutch state €6 billion and that nominal premiums will go up €300 per year per person and thus warns the House of Representatives. (Kuipers, 2023) Then in May 2024 follows the definitive coalition agreement, which is discussed in the following section 2.3.3.

2.3.2 Coalition agreement

The political landscape in the Netherlands saw a significant shift leading up to the coalition agreement that has shaped the current policy stance on healthcare deductibles. This agreement, which was outlined and released on May 15, 2024, by Dijkgraaf en Van Zwol (2024b), was titled *"Hoofdlijnenakkoord tussen de fracties van PVV, VVD, NSC en BBB."* It set forth the collaborative policies of these political groups, with detailed financial implications further elaborated in the "*Budgettaire bijlage hoofdlijnenakkoord*" (Dijkgraaf & Van Zwol, 2024a).

The coalition agreement introduces substantial changes to the healthcare deductible, which are detailed as follows:

- **Freezing of the deductible:** The deductible under the Health Insurance Act will remain at 385 euros for the years 2025 and 2026. This decision aims to provide stability and predictability for policyholders in the immediate future.
- **Reduction starting 2027:** Effective from January 1, 2027, the deductible will be significantly reduced to 165 euros. This change represents more than a 50% reduction, aiming to lessen the financial burden on individuals.
- **Spread the deductible:** The deductible will be capped at a maximum of fifty euros per treatment. This means that for any single treatment, policyholders will not pay more than fifty euros, regardless of the total cost of the treatment.

- **Automatic adjustments in premiums and contributions:** Due to the financing structure of the Health Insurance Act, any changes to the deductible will result in automatic adjustments in the nominal premium, the income-related contribution, and the healthcare allowance. These adjustments are necessary to ensure that the funding for healthcare remains balanced and sustainable.

These measures are designed to reduce care avoidance and remove barriers for long-term and chronically ill people. (Dijkgraaf & Van Zwol, 2024b)

2.4 Actor responses

This chapter examines the anticipated responses of main actors on the policy change regarding the deductible within the Health Insurance Act. Analyzing how different actors within the healthcare system, including healthcare users, healthcare providers, health insurers, and the administrator of the healthcare insurance fund are likely to respond to the policy changes. This will address the research question: *"How do the main actors respond to the policy change of the deductible?"*

2.4.1 Role of cost dynamics in healthcare use

Financial Incentives in Healthcare

Financial incentives significantly influence healthcare utilization, affecting patient decisions based on costs. Studies, such as Van der Geest and Varkevisser (2015), found that patients often choose cheaper providers, while Lopes et al. (2022) highlighted that higher costs reduce healthcare use, particularly among young adults transitioning to adulthood. These findings emphasize that lower costs increase healthcare utilization, whereas higher costs discourage it.

Co-payment Effects

Co-payments, including deductibles, serve as financial barriers to discourage unnecessary healthcare use. Research by Remmerswaal et al. (2015) showed that increasing the deductible led to a 10% reduction in healthcare use, illustrating how patients respond to higher out-of-pocket costs. While co-payments can reduce overuse, they can also deter necessary care, highlighting the need to balance financial deterrents with access to essential services.

Deductibles in the Dutch Healthcare System

The introduction of the mandatory deductible in 2008 shifted the Dutch healthcare system towards increased patient cost-sharing. Studies like Hayen et al. (2021) and Remmerswaal et al. (2019) found that deductibles effectively reduce healthcare spending but can also deter necessary care. Alessie et al. (2020) showed that deductibles reduce moral hazard, particularly among low-risk individuals, but Remmerswaal et al. (2023) noted that these individuals are less responsive to price changes than high-risk groups. These findings underscore the importance of balancing cost control with patient access in the design of deductibles and other cost-sharing mechanisms.

The studies reviewed demonstrate that financial incentives, co-payments, and deductibles significantly influence healthcare utilization by altering patient behavior through cost considerations. Lowering costs can increase healthcare usage, while higher costs often deter it,

affecting access to necessary care. Deductibles, in particular, are effective at controlling healthcare spending and reducing moral hazard, but they can also lead to unintended consequences such as care avoidance, especially among low-income and high-risk groups.

2.4.2 Expected response of main actors to policy change

The main actors within this research include healthcare users and non-users, who together form society, healthcare providers, health insurers, and the administrator of the healthcare insurance fund. A conceptual model was previously created and described in Section 2.2 Conceptual Model. Based on this model and an understanding of the healthcare system's functioning, hypotheses can be made about how the main actors will respond to a change in policy.

- **Society:** The deductible serves as a perceived price tag and thus the cost barrier for healthcare usage. When it is reduced or eliminated, as described in Section 2.3.1 Policy Change, the expectation is that healthcare users will use more healthcare services because of better access to care due to the reduction in the perceived price of care. This expectation is grounded in the principle of price elasticity of demand, which suggests that lower costs lead to higher consumption. Thus, a decrease or elimination of the deductible is anticipated to result in increased healthcare usage among the general population.
- **Healthcare providers:** Healthcare providers will continue to supply healthcare to meet the increased demand for healthcare services. The reduction or elimination of the deductible does not change the role of healthcare providers but may increase the volume of patients they see. Providers might need to adjust their capacity and resources to manage the potential rise in patient numbers. However, this increased demand could also lead to capacity challenges, requiring strategic planning and resource allocation to maintain the quality of care.
- **Health insurers:** Health insurers will continue to pay for the healthcare of their insured members. However, with the increased use of healthcare services due to the lowered cost barrier, health insurers may face higher expenses. This could lead to adjustments in premiums or the structure of insurance plans to accommodate the increased financial burden. Health insurers might also engage in strategic responses, such as advocating for policy adjustments or implementing measures to control costs, like promoting preventive healthcare or negotiating lower prices with healthcare providers.
- **Administrator of the Healthcare Insurance Fund:** The administrator of the Healthcare Insurance Fund is the Netherlands healthcare Institute. However, decisions on the level of the income-related contribution are made by the government and are legally supported by the 50/50 rule, as explained in section 2.1.2.4. This rule requires that funding be equally divided between income-related contributions and nominal premiums, cash payments, and government contributions for children.

2.4.3 Differentiating healthcare in society

Understanding the diversity within society is crucial for this thesis, particularly in analyzing the impact of healthcare policies. Studies by Klein et al. (2024) and Remmerswaal and Boone (2020) emphasize the importance of accounting for demographic differences within the population when assessing the effects of deductibles. This highlights the need to distinguish between different groups of healthcare users within the broader context of society.

This thesis employs a SCBA to evaluate policy changes regarding the deductible from a societal perspective, considering both healthcare users and non-healthcare users. Differentiating between these groups is vital because policy changes affect them in distinct ways:

- **Healthcare Users**: These individuals actively use healthcare services and directly experience the effects of deductible changes, such as changes in co-payments, access to care, and health outcomes. A reduction or elimination of the deductible lowers financial barriers, which can increase healthcare usage and improve health and well-being for these users.
- **Non-Healthcare Users**: This group includes individuals who do not utilize healthcare services in a given year. While they do not directly experience changes in access to care due to deductible adjustments, they are indirectly affected through broader economic impacts, such as changes in insurance premiums, taxes, or government financing of healthcare. Non-healthcare users thus play a significant role in the overall sustainability and financing of the healthcare system.

Recognizing these distinctions allows for a comprehensive understanding of the social and economic impacts of policy changes. This thesis focuses on two key perspectives:

- **Healthcare Users Perspective**: Analyzing the impact of deductible changes on those who actively use healthcare services.
- **Societal Perspective**: Assessing the broader implications of policy changes on society as a whole, including both healthcare users and non-healthcare users.

Within these groups, further differentiation can be made. Among non-healthcare users, there are those who simply do not need care and those who avoid it for various reasons, such as financial constraints, fear of treatment, or a belief that their condition will resolve without intervention (Van Esch et al., 2015).

By differentiating these perspectives, this study aims to provide a nuanced assessment of the impact of policy changes on the healthcare system and its stakeholders.

Similarly, within healthcare users, there are variations in usage patterns. For example, individuals who pay less than the full deductible use less care compared to those who exhaust their deductible. Data shows that older adults are more likely to fully utilize their deductible compared to younger individuals, often due to higher healthcare needs (Vektis, 2019).

When patients use their full deductible and experience moral hazard, a significant issue occurs. Moral hazard is traditionally viewed as a phenomenon in which insurance leads patients to use more care because it lowers the price they must pay for care. This effect occurs because individual patients, despite premiums collectively covering the cost of care, do not experience direct additional costs when using more care services. This may lead to overconsumption of healthcare services since the financial incentive for patients to moderate their healthcare consumption is reduced by insurance (Nyman, 2004; Kreier, 2019).

After spending the deductible, subsequent treatments are effectively free for the patient. While some may stop using care after receiving necessary treatment, others may begin using more services simply because there are no further costs, potentially leading to inefficiencies and increased overall healthcare utilization, overcompensation.

2.5 Conceptual effects

This chapter examines the hypothetical effects of lowering the deductible within the Health Insurance Act. By answering the question, "What are the social effects of policy change?" The following subsections discuss the increased accessibility of health care, the financial effects of increased healthcare usage, and the possible decrease in quality of care due to the increased demand on health care providers.

2.5.1 Accessibility to healthcare

Lowering the deductible reduces the financial barrier to accessing care. This therefore increases accessibility to care. In a system where the cost of care plays a significant role in individuals' decisions whether or not to seek care, the deductible acts as a barrier. By reducing or completely removing this barrier, care becomes more accessible to a broader segment of the population. People who would previously avoid care because of cost are now more likely to seek needed care. This can lead to better long-term health outcomes, as health problems are identified and treated more quickly.

In addition, increased access to care may contribute to a more preventive approach to healthcare. People will be less likely to wait for their health problems to worsen before seeking help, which can result in less serious medical treatment and lower costs eventually. Thus, lowering the deductible can not only improve direct access to care, but also strengthen the overall effectiveness and efficiency of the healthcare system.

Research on high-deductible health insurance plans has shown that increased out-of-pocket expenses can reduce the utilization of necessary healthcare services, leading to worse health outcomes, particularly for patients with chronic conditions like diabetes (Jiang et al., 2021; Agarwal et al., 2017). This thesis assumes that by lowering the deductible, the opposite effect will occur, improving access to care and health outcomes.

2.5.2 Deductible expenses

Deductibles are a fundamental component of healthcare financing, influencing how costs are shared between insurers and healthcare users. Reducing deductibles can significantly lower the direct financial contribution required from healthcare users, making healthcare more accessible and affordable. As outlined in section 2.5.1, a lower deductible lessens the financial burden on individuals, especially those with limited financial resources, thus facilitating better access to necessary care.

This reduction in deductible expenses means that healthcare users retain more of their money, allowing them to allocate these savings towards other needs and activities. The resulting increase in disposable income can lead to improved overall welfare in society. With more money available for discretionary spending, individuals can invest in other areas of their lives, contributing to broader benefits and societal prosperity.

This approach emphasizes the dual benefits of less deductible expenses: improved access to health care and improving social welfare by preserving more financial resources for the individual.

2.5.3 Healthcare use

When the perceived cost of healthcare decreases, such as through a reduction in deductibles, the usage of healthcare services typically increases. This includes more frequent visits to specialists, diagnostic tests, and treatments. The extent of this change in healthcare usage can be approximated by the concept of price elasticity.

Price elasticity in healthcare refers to how sensitive the demand for healthcare services is to changes in their cost. This concept is essential for understanding the impact of financial incentives, such as deductibles and insurance premiums, on healthcare consumers' behavior.

The study by Remmerswaal et al. (2023) indicates that low-risk individuals, who often opt for voluntary deductibles in addition to the mandatory deductible, demonstrate lower demand elasticity compared to high-risk individuals. This suggests that low-risk individuals are less responsive to changes in healthcare costs than high-risk individuals. These findings highlight the complex relationship between financial incentives and consumer behavior in healthcare, showing that the effectiveness of financial measures can vary based on the risk profile of the insured.

On the other hand, Bischof and Schmid (2018) found that increases in insurance premiums in Switzerland significantly boosted the rate of switching healthcare plans, indicating high price elasticity among young adults. This suggests that younger individuals are more sensitive to price changes in their health insurance, reflecting higher elasticity.

These studies underscore the importance of recognizing how different population subgroups respond differently to financial incentives. Understanding these varied responses is crucial for refining financial incentives in healthcare policies to avoid undesirable effects, such as the underuse or overuse of healthcare services. Identifying the diverse reactions to price changes across different deductible groups is essential for accurately assessing shifts in healthcare usage.

2.5.4 Nominal premium and income dependent contribution

A lower deductible reduces the perceived cost of using care, leading to an increase in healthcare usage. However, this does not mean that care itself becomes less expensive; total health care expenditures still need to be financed. The increase in this expenditure is borne by society through nominal premiums and income-related contributions, as required by the 50/50 cost-sharing rule described in section 2.1.3.

According to the 50/50 cost-sharing rule, healthcare costs are financed 50% through the income-dependent contribution and the other 50% through the nominal premium, excess payments, and the state contribution for children. Since the state contribution for children is fixed and depends on the number of children, it cannot be adjusted and remains out of consideration. With the reduction in deductibles, the nominal premium must increase to meet the 50% ratio against the income-dependent contribution. In addition, the increase in total healthcare costs creates a necessary increase in both the income-dependent contribution and the nominal premium.

As a result, the entire society bears the financial burden of increased healthcare usage and the decrease in deductible contributions in the form of a change in nominal premium and income dependent contribution.

2.5.5 Health benefits

Lowering the deductible can lead not only to increased use of care, but also to significant health benefits for the population. Increased healthcare usage ensures that health problems are recognized and treated earlier, leading to better health outcomes, especially among people with chronic conditions. This is consistent with findings from research on self-management programs for chronic diseases, such as heart and lung disease, stroke, and arthritis. The Chronic Disease Self-Management Program found that over a two-year period, participants experienced a significant reduction in emergency room and outpatient visits, as well as a decrease in health stress and an improvement in self-efficacy (Lorig et al., 2001). These improvements in health were accompanied by a stabilization in hospitalizations, suggesting that preventive and frequent use of care helps maintain health without unnecessary increases in care consumption.

In addition, findings show that decreases in healthcare usage, such as during the SARS epidemic in Taiwan, can lead to worsened health outcomes, with a significant increase in mortality rates in patients with diabetes and cerebrovascular disease (Wang et al., 2012). This highlights the importance of adequate access to and utilization of care, especially among vulnerable groups, to prevent serious health problems.

Altogether, these findings suggest that increased healthcare usage can have health benefits. Not only does it help to better manage existing health problems, but it can also contribute to a more preventive approach to care, benefiting the overall health of the population.

2.5.6 Quality of care

As access to care increases, healthcare use will increase. This means that more people will use health services, such as visits to physicians, specialists, diagnostic tests, and treatments. This increase in healthcare utilization directly impacts healthcare providers, who will experience increased demand for their services.

Increased workload for healthcare providers
With an increase in the number of patients, the workload for healthcare providers increases. General practitioners, specialists, nurses, and other medical personnel will have to handle more consultations, provide more treatments and perform more administrative tasks. This increased workload can lead to longer hours, increased workload, and the need to hire or train staff to keep up with demand.

Pressure on healthcare capacity
The increased demand for care can put pressure on the capacity of healthcare facilities. Waiting lists may grow longer and the time healthcare providers can devote to each patient may decrease. Hospitals and clinics may face bed shortages and overcrowded waiting rooms, reducing the efficiency of care delivery. These capacity issues require strategic planning and investment in infrastructure and staffing to manage increased demand.

Potential decline in quality of care
The increased pressure on healthcare providers and healthcare facilities may affect the quality of care. If healthcare providers must treat more patients in the same amount of time, they may spend less time per patient. This can lead to less thorough consultations, an increased risk of medical errors and an overall decrease in patient satisfaction. Moreover, the increased workload can lead to burnout among healthcare providers, which has further negative effects on the quality of care.

To address these issues, healthcare facilities should proactively plan to increase capacity and manage workload. This may include training more caregivers, expanding infrastructure and introducing innovative models of care to improve efficiency. By taking these measures, the healthcare industry can better respond to increased demand and maintain quality of care despite increased access and utilization of healthcare services.

2.6 Conclusion

This section provided answers to the five sub-questions that are essential for understanding the deductible within the Dutch healthcare system. By exploring these aspects in detail, the chapter prepares the groundwork for evaluating the broader societal effects of the proposed policy changes.

1. What characterizes the structure and functionality of the healthcare infrastructure in the Netherlands?
The Dutch healthcare system is characterized by a comprehensive legislative framework, primarily governed by the Health Insurance Act, which mandates compulsory health insurance for all residents. This system is rooted in solidarity, ensuring equal access to healthcare for all, regardless of income, age, or health status. Key principles include the insurance obligation, acceptance obligation without premium differentiation, and the mandatory deductible, which promotes cost awareness among policyholders. The system relies on a structured interaction between citizens, healthcare providers, and insurers, coordinated through regulated markets for healthcare delivery, purchasing, and insurance. This framework ensures accessible, high-quality healthcare, supported by various financial mechanisms that balance contributions from citizens, employers, and the government.

2. What are the financial flows within the healthcare system, with a special focus on the role of the deductible in this system?
Financial flows within the Dutch healthcare system are designed to ensure sustainable and equitable funding of healthcare services. These flows involve contributions from citizens through nominal premiums, income-dependent contributions from employers to the Health Insurance Fund, and government funding for children. The deductible serves as a critical financial mechanism, acting as a direct payment by healthcare users that promotes cost awareness and helps manage care utilization. The system's 50/50 cost-sharing rule ensures that healthcare costs are evenly split between income-dependent contributions and nominal premiums, deductible payments, and government contributions, maintaining a balanced funding structure that supports the overall sustainability of the healthcare system.

3. What does the policy change regarding deductibles in the Dutch healthcare system entail?
The current policy change regarding deductibles, as outlined in the 2024 coalition agreement, introduces significant adjustments to the existing system. Key elements include freezing the

deductible at €385 for 2025 and 2026, reducing it to €165 from January 1, 2027, and capping the deductible at a maximum of €50 per treatment. This "spread" approach aims to alleviate financial strain on policyholders.

4. How do the main actors respond to the policy change of the deductible?
Responses to the policy change vary among key actors in the healthcare system. Society, including healthcare users, is expected to increase healthcare usage due to the reduced financial barriers, leading to improved access but also higher overall costs. Healthcare providers will face increased demand, necessitating adjustments in capacity and resources to maintain quality care. Health insurers will experience higher expenses from increased usage and lower deductible revenue, potentially leading to higher nominal premiums or adjustments in the Health Insurance Fund's contributions. The overall response highlights the interconnectedness of these actors and the need for strategic planning to manage the impacts of the policy change effectively.

5. What effect does the policy change of the deductible in Dutch healthcare have on Dutch society?
The policy change lowering the deductible reduces financial barriers to care, making healthcare more accessible and potentially improving long-term health outcomes through increased and timely medical attention. However, this accessibility comes with increased healthcare usage and associated costs, which must be covered by society through higher nominal premiums and income dependent contribution. The increased demand also puts pressure on healthcare providers, potentially affecting capacity and quality of care. Balancing these effects is crucial to ensure the benefits of improved access do not compromise financial sustainability and care standards within the healthcare system.

This chapter has established the theoretical framework by addressing the sub-questions concerning the Dutch healthcare system, its structure, and the implications of changes to the deductible. The insights gained provide a comprehensive basis for the MKBA, which will be conducted in the next Chapter 3: Methods.

Chapter 3: Methods

This chapter outlines the methods used in the SCBA to evaluate the effects of policy changes in healthcare. It covers the construction of the base case and policy scenarios, quantification of key effects, and the calculation of results. The chapter also includes sensitivity and uncertainty analyses to assess the robustness of the findings.

3.1 Social Cost-Benefit Analysis

Social Cost-Benefit Analysis (SCBA) is a systematic method of evaluating the costs and benefits of policy measures from a societal perspective. This involves comparing a base case, in which the measure is not introduced, with a scenario in which the measure is introduced. The purpose of a SCBA is to provide an objective basis for policy choices, considering both priced and unpriced effects (Centraal Planbureau et al., 2013).

The SCBA is used to analyze the welfare-economic impact of policy measures. This involves identifying the effects of a measure on the welfare of society. By quantifying and, where possible, monetizing these effects, the SCBA provides a comprehensive overview of the advantages and disadvantages of a measure. This allows policymakers to determine whether the benefits outweigh the costs (Eijgenraam et al., 2000).

The SCBA is based on social welfare theory, which aggregates the welfare of individuals into the welfare of society. All effects, both priced and unpriced, are included as they affect individual and social welfare. Changes in welfare are often expressed in terms of willingness to pay for the positive effects of a measure (Central Planning Bureau et al., 2013).

First the base case is established, this forms the basis over time, against which the alternative models can be compared. Then the alternative models are prepared, and the effects are qualified and quantified.

The preparation of an SCBA involves several steps. First, the baseline scenario is determined, with effects qualified and quantified over time to create a baseline. Then, policy alternatives are set out relative to the base case. These impacts are qualified, quantified and compared to the base case over time. A summary of total costs and benefits is then prepared, including impacts that cannot be quantified or monetized (Central Planning Bureau et al., 2013).

While the SCBA is a powerful tool, there are practical limits to its feasibility. Some impacts are difficult to quantify or monetize, and the data needed for a full SCBA may be limited (Eijgenraam et al., 2000). In such cases, assumptions and approximations can be used to still provide an understanding.

3.2 Analysis of the base case and policy scenarios

3.2.1 Base case

The base case for this SCBA assumes retention of the current policy, with an annual deductible of €385. This base case serves as a reference point for comparing and evaluating the effects of any

policy changes. To develop this base case, a number of assumptions are made to shape the model and ensure a consistent basis for further analysis.

Assumptions for the development of the base case:

1. **The healthcare usage of the Netherlands is proportional to population growth:** This assumption implies that total healthcare usage will increase with the growth of the Dutch population. As the population grows, the number of healthcare users will increase proportionality.
2. **The percentage of people paying deductibles to some extent will remain the same over time:** Under this assumption, the percentage of the population that pays all or part of their deductible will remain unchanged over time. This means that while the absolute number of people paying deductibles will increase due to population growth, the proportion of people within each deductible payment category will stay the same. For example, if 30% of the population currently pays their full deductible, this percentage remains consistent, even as the total population grows.

Through these assumptions, a base case can be created that captures the current healthcare usage and financial contributions of the population, considering population growth and if deductible payment patterns remain unchanged. This base case serves as a foundation for analyzing and comparing the effects of policy changes against the current situation.

3.2.2 Overview of policy scenarios

It follows from Chapter 2.3 Policy changes that the policy choice will be implemented with an annual maximum deductible of €165 with €50 per treatment. This scenario will therefore be worked out. However, to set up the model properly and make good comparisons with the various policy options that were presented during the Lower House debates, several scenarios have been worked out in this SCBA.

These scenarios included developing an abolition scenario, followed by scenarios representing reductions to €50 and €165. Table 3.1 outlines the different scenarios considered in this analysis, providing a clear framework for understanding the transitions and comparisons.

Table 3.1: Scenario elaborations

Scenario	Elaboration
Base case (Retention)	Healthcare usage remains consistent with current patterns, adjusted for population growth. Individuals who pay their full deductible show no change in behavior, only a proportional increase with population growth.
Abolition	The abolition is a reduction of the deductible from €385 to €0, a change of -100%. Through price elasticity this allows healthcare usage to be calculated. The increase in healthcare usage increases health benefits.
Reduction €50	Reduction of the deductible from €385 to €50 a change of -87%, through price elasticity this allows healthcare usage to be calculated. The increase in healthcare usage increases health benefits.
Reduction €165	Reduction of the deductible from €385 to €165 a change of -57%, through price elasticity this allows healthcare usage to be calculated. The increase in healthcare usage increases health benefits.
Spread	Reduction of the deductible from €385 to €50 per treatment, up to a maximum of €165. This scenario distinguishes between frequent and infrequent healthcare users by paying per treatment. • Infrequent healthcare users with one treatment per year a reduction of the deductible from €385 to €50 a change of -87%, through price elasticity this allows healthcare usage to be calculated. The increase in healthcare usage increases health benefits. • Frequent healthcare users with at least three treatments per year a reduction of the deductible from €385 to €165 a change of -57%, through price elasticity this allows healthcare usage to be calculated. The increase in healthcare usage increases health benefits. • But it can also reduce healthcare usage among frequent healthcare users. This is because there are healthcare users, who took additional treatments, because they were free after the deductible in the base case was filed. By paying per treatment, these people will feel a new counteractive effect, which can also make healthcare usage decrease.

By using these scenarios, the model can incrementally assess the effects of different deductible levels, culminating in the spread option proposed in the coalition agreement. This structured approach allows for a detailed analysis of how changes in the deductible affect healthcare usage, financial contributions, and overall system sustainability.

3.2.3 Comparing scenarios to the base case

The SCBA first establishes the base case, then analyzes the differences between this base case and the various scenarios. The effects of each scenario are calculated based on the deviation from the base case. As a result, this SCBA focuses directly on the changes that occur compared to the base case, rather than fully calculating the effects of both the null alternative and the scenarios, and then subtracting them from each other to determine the difference. In other words,

the null alternative is considered the reference point (0), and the effects within the scenarios represent the changes relative to this reference point.

3.3 Effects

3.3.1 Selection of effects

In section 2.5 several effects are identified that could be affected by changes in the deductible. This section explains which effects were chosen for further analysis and why others were excluded.

Included effects

- **Accessibility to healthcare:** This effect puts together section 2.5.1 Accessibility to healthcare and section 2.5.2 Deductible expenses.
- **Nominal premium and income-dependent contribution:** This is primarily based on missed deductible income and increased costs of healthcare usage, combining section 2.5.2 Deductible expenses, 2.5.3 Healthcare use, and 2.5.4 Nominal premium and income-dependent contribution.
- **Health benefits:** This effect is expressed in health benefits as a result of improved accessibility to care due to more healthcare usage, section 2.5.5 Health benefits.

Excluded effects

- **Potential decline in quality of care:** In section 2.5.6 Quality of care is described, while this is an important aspect, it is not further elaborated in the SCBA because it is difficult to quantify and depends heavily on other complex factors, such as technological developments and efficiency improvements in the healthcare system. Moreover, there is insufficient specific data available to accurately model this effect, and it is highly dependent on future developments that are difficult to predict.

3.3.2 Overview of SCBA

The structure of this SCBA is based on inputs, intermediates and outputs. This is worked out in figure 3.1 to create an overview.

The difference in healthcare usage is crucial in the SCBA. This is examined together with population size, healthcare usage, deductible (set by policy), and price elasticity. Where population size determines the size of society and grows over time. Various effects, or outputs, follow:

1. **Accessibility to healthcare:** This is influenced by the level of deductible, which is determined by policy, and the change in healthcare usage.
2. **Nominal premium and income dependent contribution:** These are determined by the frequency and intensity of healthcare usage within the population and the decrease in deductibles over all people.
3. **Health benefits:** These are measured with the amount of healthcare usage change en de elasticity for health benefits.

By looking at these factors in context, a detailed picture of the effects of policy options on society can be drawn.

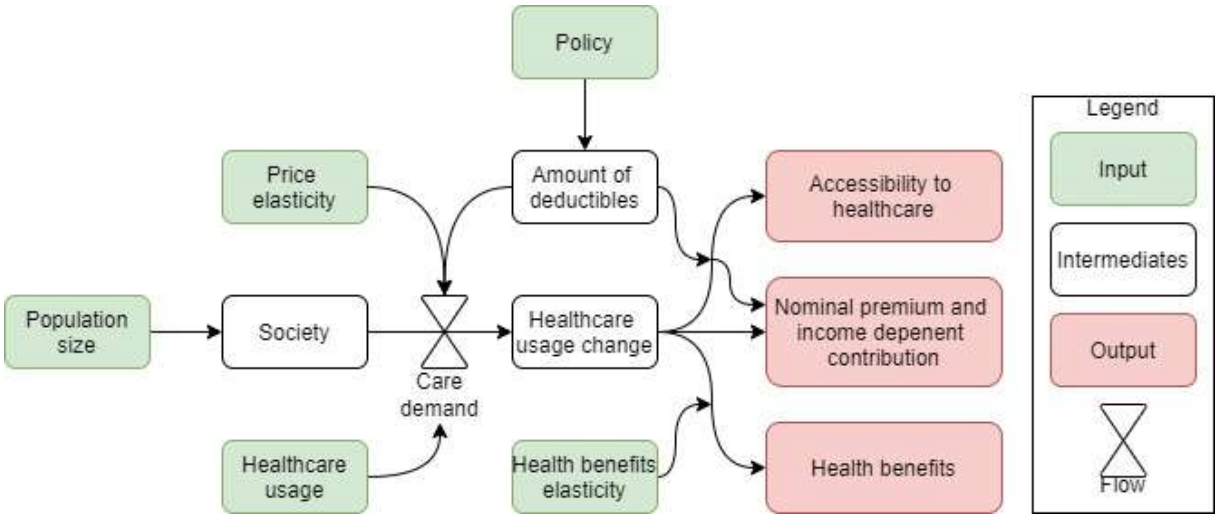

Figure 3.1: Overview of SCBA structure

3.3.3 Quantification of effects.

3.3.3.1 Accessibility to healthcare

Healthcare becomes more accessible by lowering the perceived cost of healthcare, deductible. In addition, it leaves people with more money, which can lead to improved overall welfare in society. With more money available for discretionary spending, individuals can invest in other areas of their lives, contributing to broader benefits and societal prosperity.

The change in accessibility to healthcare, expressed as deductible expenses is quantified by calculating the difference between total deductible spending in the scenarios and the base case. This process involves identifying the population affected by this change and calculating each person's perceived welfare change based on the change in deductible expenses.

There are two groups of people affected by this change:

- **People with lower deductibles expenses: This** group already consisted of healthcare users in the base case. In the scenarios with reduced deductibles, they continue to use care, but with lower deductible expenses, resulting in direct benefits.
- **People with higher deductible expenses:** This group did not use care in the base case. In the scenarios with a reduced deductible, healthcare becomes more attractive because of lower costs, so they decide to use healthcare. For them, deductibles go up, leading to costs.

The data for this calculation come from the percentage distribution of deductible expenses by population (Vektis, 2017) and population size from CBS (CBS Statline, 2023).

The monetary value is expressed as the total amount of savings for healthcare users as a result of the reduction of the deductible, directly represented in euros, providing a clear financial benefit.

Assumptions

- **Constant distribution of deductible expenses:** The deductible expenses are distributed by percentage across the population, with some people using their full deductible, others using

only a portion, and some using none at all. The assumption is that this percentage distribution of deductible spending remains constant over time. While absolute spending may vary over time, the percentage of the population within each category does not change.

3.3.3.2 Nominal Premium and Income-Dependent Contribution

This effect is the cost increase due to the policy change, which will be recovered from society. It involves an increase in healthcare usage and the lack of deductible income for the state. As discussed in Section 2.1.3 Financial Flows of the Health Insurance Act and Section 2.3.2 Coalition Agreement, these additional costs of the policy change are reflected in an increase in the Nominal Premium and Income Dependent Contribution.

The increase in healthcare usage will lead to more costs, this must be paid the society. This is done through a higher nominal premium and income-dependent contribution. The change in total healthcare usage is measured in the change in total healthcare costs, which depends on the price elasticity of the deductible. A percentage price change in the deductible causes an inverse percentage change in healthcare usage.

There is also the missing revenue from the deductible. Less is now paid for the deductible by healthcare users, so there is also less money coming in to pay for total healthcare costs. This means that the nominal premium and income-dependent contribution also go up for this. The difference in deductible revenue is equal to the change in society's deductibles.

The change in deductible income and healthcare usage expenditures combine to produce the change in the nominal premium and income-dependent contribution.

The data sources for this calculation include expected healthcare costs (as calculated in this thesis with CBS Statline, 2023, and Vektis, n.d.-a to n.d.-l) and the price elasticity of the deductible (Van Vliet, 2004). The monetary value is expressed in euros and includes both missed deductible income and increased healthcare costs to society.

Assumptions

- **Relationship between deductible revenues, healthcare usage and premiums:**
    1. **Direct relationship between deductible revenues of health insurers and premiums:** The assumption that a decrease in deductible expenses leads directly to a shortfall in revenues for health insurers, which must be fully offset by higher nominal premiums and income-dependent contributions and vice versa. (Ministerie van Financiën, 2015)
    2. **Direct relationship between healthcare costs and premiums:** The assumption that any increase in healthcare costs resulting from increased healthcare usage is passed on in full to society through higher nominal premiums and income-dependent contributions and vice versa. (Ministerie van Financiën, 2015)
- **Impact of price elasticity**
    1. **Constant price elasticity of healthcare usage:** The assumption that the price elasticity of the deductible, as established by Van Vliet (2004), remains consistent and applies accurately to the scenarios. This assumes that a percentage change in the deductible always causes a predictable inverse percentage change in healthcare usage.

2. **Uniform impact of price changes:** The assumption that a change in deductible causes a uniform response across the population, regardless of individual differences in health care needs, financial circumstances, or health care consumption patterns.

3.3.3.3 Health benefits

The health benefits resulting from improved access to care are quantified by converting the increase in healthcare usage into Quality-Adjusted Life Years (QALY) using a price elasticity for QALYs. These health benefits are then monetized by applying the value of a QALY.

In this SCBA, improved access to care and the associated health benefits are analyzed jointly to avoid double counting. The benefits of improved access to care are expressed primarily in terms of health benefits because this is a directly measurable and quantifiable outcome. However, this does not mean that other benefits, such as increased satisfaction and convenience, are ignored; these are implicitly included in the broader health impact on the population. Health benefits remain an essential measure because they contribute directly to the overall prosperity and well-being of society.

Data for this process come from expected healthcare usage (calculated in this thesis using: CBS Statline, (2023), and Vektis, (n.d.-a to n.d.-l)), the price elasticity of health benefits (Zorginstituut Nederland, 2018), and estimates of the value of a QALY (Zorginstituut Nederland, 2018).

The monetary value is calculated by multiplying the increase in QALYs by the estimated monetary value of a QALY, which represents the total gain in euros.

Assumptions

- **Quantification and monetization of health benefits:**
  1. **Constant price elasticity for QALYs:** The assumption that the price elasticity for QALYs, as established by Zorginstituut Nederland (2018), remains stable and applicable in the current context. This assumes that an increase in healthcare usage consistently leads to a predictable increase in QALYs and vice versa.
  2. **Direct conversion of healthcare usage into QALYs:** The assumption that increases in healthcare usage can be accurately converted into QALYs, with each additional unit of healthcare usage contributing to a measurable improvement in quality of life and health.
  3. **Monetization of health benefits:** The assumption that the value of a QALY can be accurately monetized and that this monetary value by Zorginstituut Nederland (2018) correctly reflects the total societal benefit in euros.
- **Valuation and methodological choices:**
  1. **Equal valuation of health benefits:** The assumption that health benefits are valued equally for all individuals within the population, regardless of differences in individual health status, access to care, or socioeconomic status.
  2. **Health benefits as the primary measure:** The assumption that the main benefits of improved access to care are measured in terms of health benefits, and that these benefits are sufficient to represent the social value of improved access to care.
  3. **Avoiding double counting:** The assumption that health benefits and improved access to care can be considered as one in order to avoid double counting, meaning that the benefits of care access are expressed only in terms of health benefits.

3.3.4 Application of the "Rule of Half"

This section introduces the “Rule of Half” as a specific technique within cost-benefit analysis to calculate changes in consumer surplus. The “Rule of Half” is applied to calculate the additional welfare benefit resulting from the increase in health care consumption due to lower prices.

Appendix 8.4 explains the concept of consumer surplus; this section applies it to the policy change for deductibles. When applying consumer surplus to reduce the deductible, the original price (p0) is set at €385, as used in the base case. The new price (p1) varies depending on the chosen policy alternative: €0, €50, or €165. The change in healthcare usage is represented as q, where q0 is the healthcare usage in the base case and q1 is the changed healthcare usage after application of the policy alternative. This is shown in figure 3.2.

This change in price and quantity creates two groups: existing consumers (A) and new consumers (B). The existing consumers are the healthcare users, while the new consumers are the people who, because of the reduction of the deductible, now also purchase healthcare. This group is defined as No care avoider anymore. For the latter group, the effects are only half weighted, since their demand for care is only triggered by the price reduction and they did not use care initially. This is shown in figure 3.2.

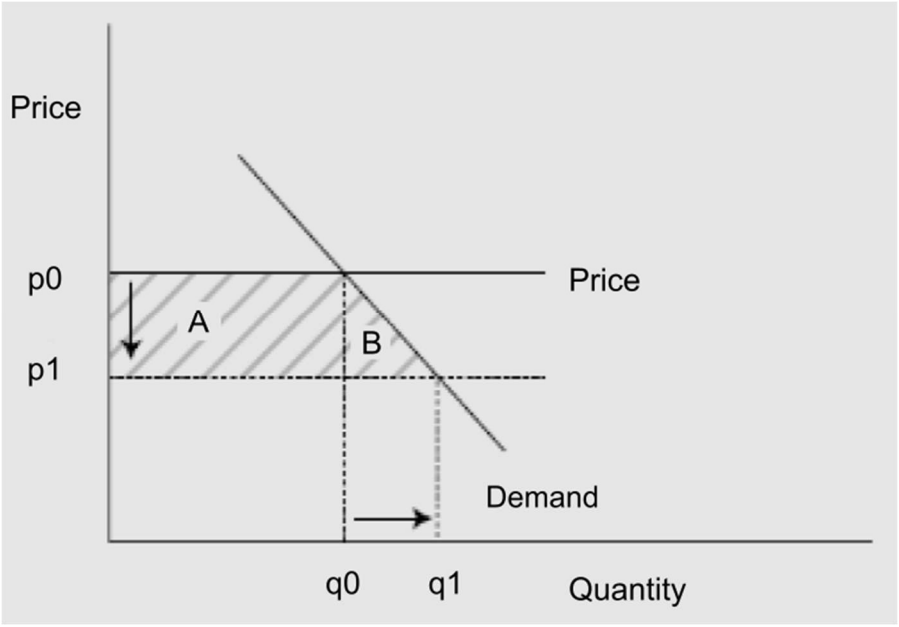

Figure 3.2: Rule of half, consumer surplus

The approach allows the calculation of consumer surplus for both existing and new healthcare users, effectively quantifying the effect of deductible reductions on consumer welfare. This calculation is integrated into the analysis of impacts. In the SCBA, these effects are expressed as welfare gains, with 50% of the welfare gains for all new users included in each effect.

This method helps balance the analysis and ensures that the effect on new users is included, albeit at a reduced rate to reflect their marginal benefit.

3.3.5 Time horizon

3.3.5.1 Time period

The time period chosen for this SCBA is from 2027 to 2070. This period was carefully chosen based on both practical and methodological considerations.

Starting point: 2027

The policy change, as proposed in the coalition agreement, goes into effect in 2027. While it would be possible to start the analysis in 2025, the effects in 2025 and 2026 are zero because the policy is not yet in effect. To provide a better picture of the effects of the policy choice, the SCBA starts in 2027, when the policy change actually takes effect.

End point: 2070

The analysis period extends to 2070, as population projections from the Central Bureau of Statistics (CBS Statline, 2023) are available until that year. This longer time horizon provides valuable insights into long-term effects.

3.3.5.2 Discounting

In an SCBA, future costs and benefits are translated back to their value at the time a project begins; this is called discounting. The idea behind discounting is that people prefer money now to money in the future. This is because money available now can be invested and earn interest. Thus, a euro received today has a higher value than a euro available only in the future. This is used to compare the costs and benefits of a project that fall at different times by calculating them back to a common starting point, the base year. (*Wat Is Disconteren en Wat Is de Discontovoet? | Informatie Over de MKBA*, z.d.).

Discounting is performed using a fixed rate per year, called the discount rate. This rate reflects the opportunity cost of capital and the expected return on investment and corrects for the fact that future cash flows are less valuable than direct cash flows. (*Wat Is Disconteren en Wat Is de Discontovoet? | Informatie Over de MKBA*, z.d.)

Relevance to the thesis

In this thesis, discounting is not necessary because the policy change results in annual, constant costs without a large initial investment. Since there is no fluctuation in costs over time, there is no need to discount them back to their present value. The analysis focuses on the annual impact of the policy change, making discounting irrelevant.

3.4 Calculations

This section explains the calculation of the effects. It first discusses the base case, describing how healthcare usage is estimated for the period 2027-2070. Then the different policy options will be discussed, explaining how the effects are constructed and calculated.

3.4.1 Calculation base case

This section explains that healthcare usage is estimated based on population growth and further discusses the distribution of people in terms of spending on the deductible. It also discusses the use of consumer surplus, thus creating a clear description of the base case.

3.4.1.1 Forecasted healthcare usage

For the base case, the forecasted healthcare usage has to be determined for the period 2027-2070. The known healthcare usage from the period 2011-2021 is used (Appendix 8.3.1.1 Healthcare usage 2011-2021). To make the forecast, the population size in 2011-2023 and the forecast population size 2024-2070 are also considered (Appendix 8.3.1.2 Population size).

Regression analysis is used to predict healthcare usage for the period 2022 through 2070 based on estimated population growth. A directional coefficient is determined for each age group to estimate healthcare usage per year. These values are then summed to create an overall picture of healthcare usage. This analysis is shown in figure 3.3, which shows healthcare usage for the period 2011-2021 in orange, forecasted healthcare usage for the period 2022-2070 in blue and the transition from available to forecasted data, 2021 to 2022 in green.

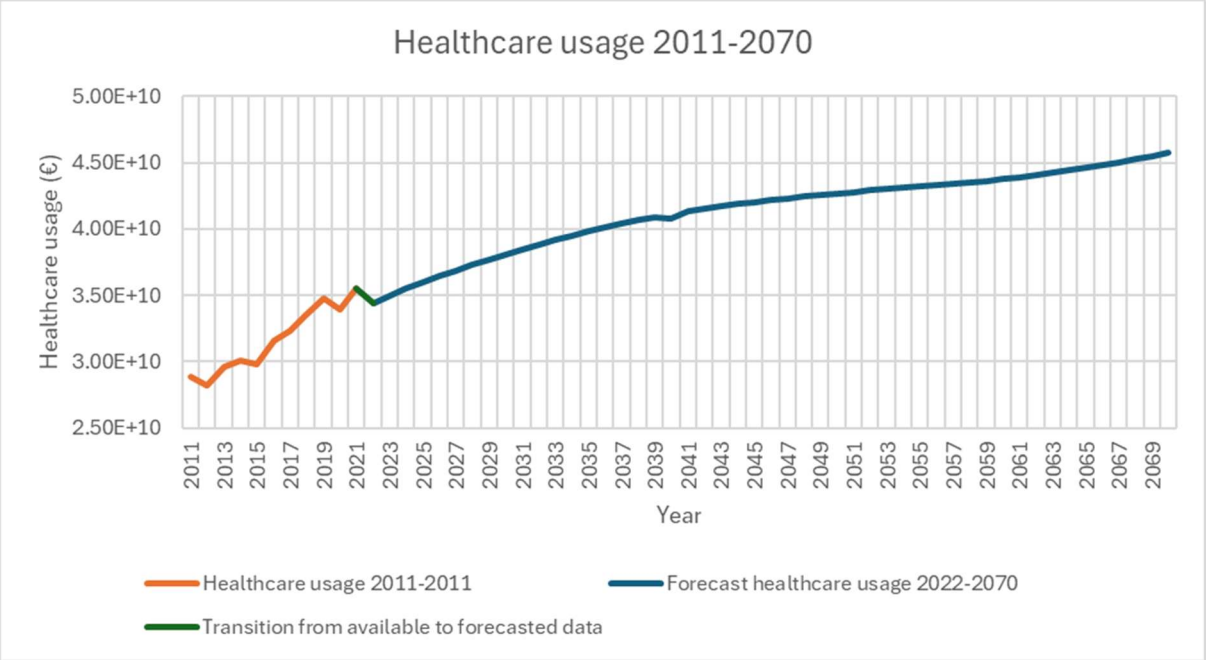

Figure 3.3: Healthcare usage 2011-2070[2]

[2] In figure 3.3 a noticeable aspect of the graph is that from 2021 to 2022, at the point where the transition from available data to forecasting occurs, there is a visible decline in the graph. This dip in healthcare usage in 2022 can be explained by the fact that it is the first year included in the forecast. As a result, 2022 aligns with most of the period from 2011 to 2021, particularly with the years 2011 to 2020. However, 2021 stands out as an outlier due to exceptional circumstances, such as increased healthcare expenditures related to COVID-19 activities. (Centraal Bureau voor de Statistiek, 2022) Consequently, 2022 appears to show a decline compared to 2021, but when compared to the period from 2011 to 2020, 2022 is fully in line with expectations.

3.4.1.2 Distribution of deductible expenses in society

Understanding how deductible expenses is distributed across society is crucial for this thesis. Currently, the deductible in the Dutch healthcare system is €385, but not everyone uses the full deductible. Key to this analysis is identifying the proportion of individuals who fully exhaust their deductible, those who partially use it, and those who do not use it at all.

Detailed data on deductible usage are available from Vektis (2017) for the year 2015, offering insights into spending patterns across various demographic groups. Although data from other years exist, the 2015 data were selected due to their accuracy. It is assumed that the distribution of deductible expenses will remain consistent over time.

The data include percentages within age groups regarding how many individuals fall into specific spending categories: No costs, €0 - €100, €100 - €200, €200 - €300, €300 - €375, and Full deductible. Differentiation within these groups is important because healthcare usage can vary significantly among specific subgroups. For analysis purposes, the midpoint of each spending range was used as the representative deductible spending. This is explained in Appendix 8.3.2 Distribution of deductible expenses in society.

Within the "No costs" group, a distinction was made between those not in need of care and care avoiders. The latter group is further divided into current care avoiders and those who would no longer avoid care if costs were lower, thus likely to start using healthcare.

For the "Full deductible" group, further distinctions were made:

- **Chronic healthcare users**: Individuals who always meet their deductible due to ongoing healthcare needs, regardless of policy changes.
- **Healthcare users with non-additional treatment**: Those who use up their deductible and then cease further healthcare use.
- **Healthcare users with additional treatment**: Those who continue to use extra healthcare services once their deductible is exhausted, as further treatments are effectively free within that year.

Further explanation about the no costs and full deductible groups is given in Appendix 8.3.2.1 Deepening the distribution of deductible usage in society.

To further analyze these groups, Diagnosis-Treatment Combinations (DBCs) were used as a measure of healthcare use:

- Individuals with costs below €385 are assumed to use one DBC.
- Healthcare users with non-additional treatment are assumed to use one DBC beyond €385.
- Healthcare users with additional treatments are assumed to use two DBCs.
- Chronic healthcare users are assumed to use three DBCs per year, reflecting their continuous care needs.

These assumptions are essential for quantifying healthcare usage and evaluating the effects of policy changes. However, they are preliminary and may require adjustments as more refined data become available. This is explained in more detail in Appendix 8.3.2.2 Diagnosis treatment combination examination.

Table 3.2 illustrates the distribution of deductible expenses among society.

Table 3.2: Complete overview distribution of deductible expenses

Label	Range of deductible expenses	Average expense (€)	Percentage of society (%)	DBC
People not in need of care	No costs	€0	16.0%	0
Care avoiders	No costs	€0	3.2%	0
No care avoider anymore	No costs	€0	0%	1
Healthcare users €50	€0 - €100	€50	19.7%	1
Healthcare users €150	€100 - €200	€150	8.2%	1
Healthcare users €250	€200 - €300	€250	5.2%	1
Healthcare users €337.50	€300 - €375	€337.50	2.9%	1
Chronic healthcare users	Full deductible	€385	30.5%	3
Healthcare users with non additional treatment	Full deductible	€385	7.2%	1
Healthcare users with additional treatment	Full deductible	€385	7.2%	2

3.4.2 Calculations of effects

3.4.2.1 Accessibility to healthcare

Paying less in deductibles is determined by looking at the spending pattern of deductibles of the base case compared across policy options. This involves looking at how much less deductible is paid by the change in policy by group from the distribution of deductible usage by age. This is added together to determine the overall effect.

In the Abolition scenario the deductibles are abolished and thus reduced to €0. Nothing changes for the non-healthcare users (people not in need of care and the care avoiders), because they already paid no deductible in the base case. For all other groups it is different because they did pay deductibles in the base case.

In the Reduction €50 scenario, the deductibles are reduced to €50. For the non healthcare users nothing changes since this group does not pay in the base case and for the healthcare users €50 nothing changes since this group already paid €50 in the base case. For the other healthcare users something does change because they will pay less than in the base case.

In the Reduction €165 scenario the same applies as in the Reduction €50 scenario, only nothing changes for the Healthcare users €150 group.

In the Spread scenario, basically the same applies as in the Reduction €50 scenario, because in the Spread scenario, €50 per treatment is used. For the groups with 0 or 1 DBC there is therefore no difference with the Reduction €50 scenario for the Chronic healthcare users and Healthcare users with additional treatment. Chronic healthcare users are assumed to pay the maximum deductible. Healthcare users with additional treatment will pay more for additional treatment than in the base case. In the base case the additional treatments were free of charge, but now they cost €50 to €165 per treatment.

3.4.2.2 Nominal premium and income dependent contribution

This effect is composed of two components: the missed revenues from deductibles and the increase in healthcare usage. First, the missed deductible revenues, then the increase in healthcare usage are discussed.

Missed deductible revenues

Lowering the deductible must ultimately be paid by the entire society, as explained earlier. This payment is made by non-healthcare users as well as healthcare users. The costs of this are as high as the benefits of reduced deductibles and are therefore adopted 1-for-1.

Increase in healthcare usage

The change in healthcare usage depends on the demand for care, which is influenced by the perceived price, determined by the level of deductible. The extent to which healthcare usage changes due to changes in deductible levels is quantified by the price elasticity of demand and predicted healthcare usage.

In this thesis, the price elasticity of -0.14, determined by Van Vliet (2004), is used for this purpose to estimate changes in healthcare usage based on changes in the deductible. This elasticity value represents a weighted average for diverse types of healthcare and provides a useful measure for this analysis. This involves determining the increase in healthcare usage for each deductible user group and for each age and adding these up to the total.

The price elasticity of -0.14 shows that for a 1% increase in deductible, healthcare usage decreases by 0.14%. For this thesis, this relationship is used inversely: for a 1% decrease in deductible, healthcare usage increases by 0.14%. Table 3.3 shows the different percentage changes in deductible levels from the base case compared to the scenarios.

Table 3.3: Changes in the deductible by scenario

	Percentage decrease in deductible	**Percentage increase in deductible**
Abolishment	-100%	0%
Reduction €50	-87.0%	0%
Reduction €165	-57.1%	0%
Spread	-87.0% -57.1% (Chronic healthcare users)	+11.5%

Notable here are the +11.5% and the extra -57.1% in the spread scenario. The percentage of +11.5% is used for healthcare users with extra treatments, because they are inhibited in their healthcare usage; for them, an extra treatment was in fact free, but in the spread scenario the price for an extra treatment is increased to €50. The percentage of -57.1% applies to chronic healthcare users, because they will not use fewer DBCs and their reduction in deductible will therefore go up to €165.

After determining the missed deductible revenues and the increase in healthcare usage, these are added together and formed the increase in nominal premium and income dependent contribution.

3.4.2.3 Health benefits

Health benefits is expressed as an effect caused by an increase in healthcare usage. This uses a price elasticity for more spending in hospital care. The study by Zorginstituut Nederland (2018) looks at the decrease in lost QALY for additional spending in hospital care, using this price elasticity.

A QALY is a measure that combines both quantity and quality of life. One QALY is equivalent to one year in perfect health. QALYs are used in health economic evaluations to assess the cost-effectiveness of medical treatments (Van Busschbach & Zorginstituut Nederland, 2024).

According to Zorginstituut Nederland's research, the estimated elasticity is -0.156, with a marginal value for a QALY of €73600 (Zorginstituut Nederland, 2018). This means that a 1% increase in spending within hospital care provides a 0.156% decrease in lost QALYs. For this thesis, a decrease in lost QALY is seen as an increase in QALY, and spending within hospital care is used as an indicator of increased healthcare usage.

To apply this elasticity, it is important to identify the percentage increase in healthcare usage. This involved looking at the increase in healthcare usage divided by expected healthcare usage by age group to calculate the percentage increase. This percentage increase was multiplied by the elasticity and then by the marginal value for a QALY. To distribute this across society, this value was then multiplied by the number of people in the relevant age group. These values were then summed to give an overall view of health benefits.

3.5 Expressing results

3.5.1 Net present value

In the SCBA, the impacts per year are expressed as the difference of the base case in euros. For each year within the period from 2027 to 2070, total costs and benefits are calculated and then compared. Effects that generate benefits are shown positively, while effects that generate costs are shown negatively. These annual values are summed to calculate the Net Present Value (NPV). A positive NPV indicates that the policy option generates net benefits, while a negative NPV indicates that the policy option generates net costs.

3.5.2 Benefit-Cost Ratio

In addition to the NPV, the Benefit-Cost Ratio (BCR) is also calculated. The BCR represents the ratio of total benefits to total costs of a project or policy option. A BCR greater than 1 means that benefits exceed costs, indicating a favorable policy option. If the BCR is less than 1, costs exceed benefits, making the policy option less attractive.

Using the BCR in addition to the NPV is useful for several reasons:

- **Relative measure:** The NPV provides an absolute measure of net economic value, while the BCR provides a relative measure, showing how efficient an investment is by reflecting the ratio of benefits to costs.
- **Comparability:** The BCR makes it easier to compare different projects, especially when the size of investments varies. A higher BCR often indicates a more economically attractive project, even if the NPV is lower.

Using both the NPV and the BCR provides a completer and more nuanced picture of the economic feasibility of policy options.

In the SCBA, the effects per year are expressed as the difference from the base case in euros. This means that for each year within the period from 2027 to 2070, the total costs and benefits are calculated and then compared.

Effects that generate benefits are shown positively, while effects that generate costs are shown negatively. These annual values are then added together to calculate the NPV. A positive NPV indicates that the policy option generates net benefits, while a negative NPV indicates that the policy option generates net costs.

In addition to the NPV, the Benefit-Cost Ratio (BCR) is also calculated. The BCR represents the ratio of total benefits to total costs. A BCR greater than 1 means that benefits exceed costs, indicating a favorable policy option. If the BCR is less than 1, the costs exceed the benefits, making the policy option less attractive.

3.5.3 Presenting results

The results of this SCBA will be presented in different ways to provide a full understanding of the economic impact of the policy options:

- **Population**
  - **Total over the Period 2027-2070:** This provides an overview of the total NPV and other relevant measures over the entire period.
  - **Average over the Period 2027-2070:** Calculating the annual average provides insight into the annual impact of the policy options.
- **Individual**
  - **Average per Person over the Period 2027-2070:** This provides insight into the average annual impact on individual households and individuals throughout the period.

These different ways of representing results provide a detailed and transparent understanding of the economic impact of the proposed policy options. The results section of Chapter 4 will further explain, analyze, and interpret these results.

3.5 Sensitivity analysis

The purpose of this sensitivity analysis is to test the robustness of the SCBA. This is done by analyzing how sensitive the results are to variations in input variables. Sensitivity analysis is essential within an SCBA because it provides insight into the uncertainty surrounding estimates and assumptions.

Here we chose to do a single parameter sensitivity analysis. This helps identify which parameters have the most influence on the outcome of an analysis. By varying one parameter at a time, it becomes clear which variables strongly influence the outcome and which do so less.

For the sensitivity analysis, all input variables were chosen: population size, price elasticity, QALY elasticity, QALY value, total amount of DBC and distribution of deductible expenses. These variables were varied by ±10% from their baseline values. These variations were then compared to the base case to determine how sensitive the SCBA main outcomes are to changes in these variables.

The analysis was performed by first applying a positive variation (+10%) and a negative variation (-10%) for each variable relative to their original value. The results of these varied scenarios were then compared to the base case, with the percentage change in NPV and are discussed in section 4.2 Results of sensitivity analysis.

These changes provide insight into the robustness of the SCBA model to the input variables. The most sensitive variable is tested in the uncertainty analysis, this is discussed in the following section 3.6 Uncertainty analysis.

3.6 Uncertainty analysis

This section discusses an uncertainty analysis for two crucial variables within the SCBA: population size and price elasticity. The sensitivity analysis shows that these two variables have

a significant impact on the model. Therefore, this chapter examines the possible other values for these variables in order to provide a better estimate of the results in section 4.3. There, the effect of the single variables will be determined. In addition, the extreme value of the model will also be examined, giving a spread of the possible actual outcomes.

3.6.1 Uncertainty of population size

The analysis of population size used forecast data from CBS (CBS Statline, 2023). This forecast data provides insight into the expected future development of the population in the Netherlands. The CBS forecast data contain several forecast intervals, with a range where the actual future population size with a probability of 67% and the 95% interval giving a larger range. These intervals are based on statistical models and assumptions about factors such as births, mortality, and migration, so the actual future population size may differ from the predicted values.

3.6.2 Uncertainty of price elasticity

The price elasticity of -0.09 is derived from the CPB Discussion Paper “A Structural Microsimulation Model for Demand-Side Cost-Sharing in Healthcare” by Remmerswaal et al., (2019). This research uses a structural microsimulation model to predict healthcare expenditures under different cost-sharing schemes. The model is estimated using a Bayesian mixture model, which uses an extensive administrative dataset with data of Dutch residents over the period 2008-2013. This dataset includes all health care expenditures for this period, providing a robust basis for estimating price elasticities within the Dutch context.

Boone and Remmerswaal's research shows that the price elasticity of the deductible in the Netherlands is -0.09. The model simulates the effects of shifting the deductible from €0 to €400. The elasticity found is generalized over the population.

Chapter 4: Results

4.1 Results of method

4.1.1 Costs and benefits: Spread scenario

The Spread scenario shows significant welfare effects over the period 2027-2070. The total benefits amount to €125 billion, while the total costs reach €319 billion. This results in a negative NPV of -€194 billion for the entire period (2027-2070).

On an annual basis, the average annual benefits are €2.85 billion, while the average annual costs are €7.26 billion, leading to an average annual NPV of -€4.41 billion.

The BCR in the Dissemination Scenario is 0.39, meaning that for every euro invested, only 39 cents of benefits are generated.

Table 4.1: Costs and Benefits of the Spread Scenario (2027-2070)

Effect	**Total value (€)**	**Average annual value (€)**	**BCR**
Accessibility to healthcare (Benefits)	€116 billion	€2.63 billion	
Nominal premium and income dependent contribution (Costs)	-€319 billion	-€7.26 billion	
Health benefits (Benefits)	€9.62 billion	€219 million	
Total benefits	€125 billion	€2.85 billion	
Total costs	-€319 billion	-€7.26 billion	
NPV	-€194 billion	-€4.41 billion	0.39

4.1.2 Comparison of scenarios.

To gain a comprehensive understanding of the performance of the Spread scenario, it is crucial to compare the results with the three other scenarios: Abolition of the deductible, Reduction to €50, and Reduction to €165. This comparison focuses on the NPV, providing a consistent and straightforward interpretation.

The Abolition scenario has the largest negative NPV, while the Reduction to €165 scenario has the smallest negative NPV. The Spread scenario, which ultimately represents the chosen policy, also has a negative NPV.

Table 4.2: Comparison of scenarios (2027-2070)

Scenario	Total benefits (€).	Total costs (€)	Average annual NPV (€)	BCR
Abolition	€171 billion	-€374 billion	-€204 billion	0.46
Reduction €50	€126 billion	-€303 billion	-€177 billion	0.42
Reduction €165	€21.8 million	-€138 billion	-€116 billion	0.16
Spread	€1.25 billion	-€319 billion	-€194 billion	0.40

4.1.3 Impact at the individual level

In addition to the total impact on the population, it is important to look at the impact on individual healthcare users. In the Spread scenario, the impact per person in 2027 is -€256.86.

Compared to the Spread scenario, we see that the elimination of the deductible has the most negative impact per person, at -€271.60 in 2027. The Reduction to €50 scenario has a slightly less negative impact of -€236.33 per person, while the Reduction to €165 scenario has the least negative impact with -€155.20 per person.

Tabel 4.3: Impact per person per scenario

Scenario	Average annual impact per person (2027-2070, €)
Abolition	-€288.39
Reduction €50	-€250.93
Reduction €165	-€164.79
Spread	-€275.03

4.1.4 Results per effect

This section analyzes the individual impacts of the different categories within the SCBA. The focus is on the relationship of the impact of each category on the NPV. This provides insight into which impacts make the largest contributions to the NPV and which factors influence policy the most.

The following table shows the absolute value of each category and their contribution as a percentage of the total absolute NPV. This provides a clear picture of the impact of each category.

Table 4.4: Contribution of different effects to NPV by scenario (2027-2070)

Effect	**Abolition (%)**	**Reduction €50 (%)**	**Reduction €165 (%)**	**Spread (%)**
Accessibility to healthcare (Benefits)	29.6%	27.4%	10.2%	26.3%
Nominal premium and income dependent contribution (Costs)	68.6%	70.6%	86.3%	71.5%
Health benefits (Benefits)	1.8%	2.0%	3.5%	2.1%

The analysis clearly shows that the Nominal premium and income dependent contribution is the largest contributor to the NPV in all scenarios, ranging from 68.6% to 86.3%. This impact is most significant in the Reduction to €165 scenario, where these costs dominate the NPV. In contrast, Deductibles expenses have a more variable impact, contributing up to 29.6% in the Abolition scenario but only 10.2% in the Reduction to €165 scenario. Lastly, the Health benefits due to increased accessibility to healthcare, while important, consistently make the smallest contribution, ranging from 1.8% to 3.5% across scenarios. These variations underscore the complex interplay between costs and benefits in determining the overall welfare impact of each policy.

4.2 Results of sensitivity analysis

The results of the sensitivity analysis show that certain input variables have a significant impact on the welfare outcomes, while other variables have a more moderate impact. Figure 4.1 summarizes the effects of a ±10% change in various variables on NPV.

Sensitivity analysis of the model revealed some remarkable patterns that are important for understanding how different variables affect the outcome:

- **Symmetric Changes at +10% and -10%:** The results show that the changes at a +10% increase in a variable are almost exactly opposite to those at a -10% decrease. This symmetric pattern suggests that the model responds consistently and predictably to variations in the input variables.
- **Direct Influence of Population Size and Price Elasticity:** Population Size and Price Elasticity have a linear and direct influence on the NPV, with a 10% change in these variables resulting in a corresponding 10% change in the NPV. This highlights the critical importance of accurate estimates of these variables in the model.
- **Equal Influence of QALY Elasticity and QALY Value:** The influence of QALY Elasticity and QALY Value on the NPV is exactly the same, suggesting that these variables are similarly incorporated into the model. However, the influence remains below 1%, indicating that the model is less sensitive to variations in these QALY-related parameters.

- **Low Impact of Distribution Deductible expenses:** The impact of changes in Distribution Deductible Spendings across all groups is quite low, with an effect below 1%. This suggests that the distribution of deductibles does not have a substantial impact on welfare outcomes in this model, although there may still be minimal influences that fall within rounding.
- **Very Low Influence of Total amount of DBC:** The variable total amount of DBC has minimal influence on NPV, with a rounded effect of 0.0%. This suggests that this factor plays a limited role in the model and that changes in the number of DBCs have no impact on welfare outcomes.
- **Different Influence of Healthcare Users with 1 DBC versus 2 or 3 DBCs:** What is further noticeable is that healthcare users with an expected healthcare usage of 1 DBC have a positive impact on NPV at a +10% increase in their numbers. In contrast, healthcare users with 2 or 3 DBCs have a negative effect on NPV at a similar increase. This suggests that the cost-benefit ratio for users with 1 DBC is more favorable than for those with higher care needs (2 or 3 DBCs). This may be because the marginal cost of additional healthcare usage at higher DBCs outweighs the additional benefits, leading to a net negative effect on NPV.

The sensitivity analysis shows that population size and price elasticity are crucial variables for the model, as a 10% change in these variables leads directly to a proportional change in NPV. In contrast, other variables have minimal impact on NPV. This highlights the importance of accurate estimates of population size and price elasticity, while variations in less influential variables will have negligible effect on the welfare outcomes of the model.

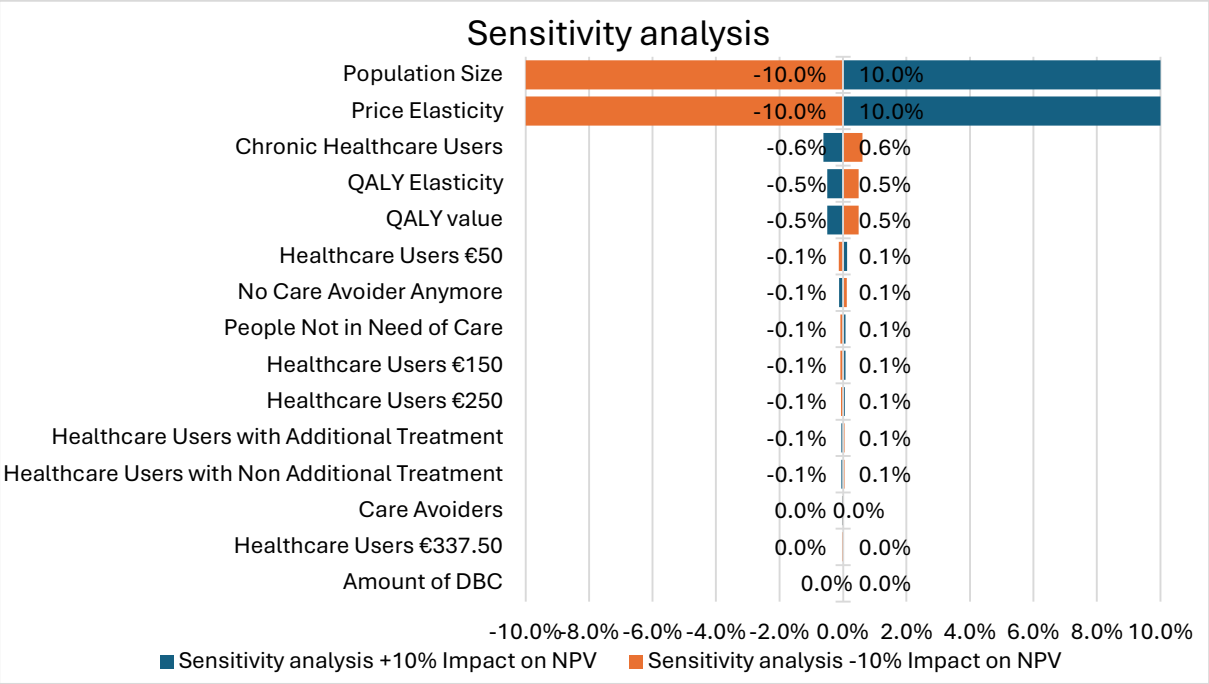

Figure 4.1: Tornado graph Sensitivity Analysis impact of parameter variation on NPV

4.3 Results of uncertainty analysis

Uncertainty of population size

The table 4.5 below shows the NPV outcomes at the Upper and Lower limits of the 95% prognosis interval and the 67% prognosis interval. These variations in NPV under different population growth

scenarios show how disparate the model's outcomes can be for demographic change. It underscores how important it is to take this into account when interpreting this thesis.

Table 4.5: Distribution of NPV under different prognosis intervals for population size

	NPV	**Percentage difference compared to reference**
Upper limit 95% prognosis interval	-2.17E+11	13.0%
Upper limit 67% prognosis interval	-2.06E+11	7.3%
Reference scenario	-1.92E+11	-
Lower limit 67% prognosis interval	-1.85E+11	-3.5%
Lower limit 95% prognosis interval	-1.75E+11	-8.5%

Uncertainty of price elasticity

The NPV outcomes are significantly affected by variations in price elasticity. When the price elasticity changes from -0.14 to -0.09, the NPV improves substantially, increasing from -192 billion to -123 billion, representing a 35.7% improvement.

This indicates that a smaller (less negative) price elasticity has a considerably more favorable impact on NPV. It suggests that using a less negative price elasticity could result in a less adverse outcome in the SCBA, highlighting the sensitivity of the analysis to this parameter.

Extreme values of NPV

Figure 4.2 illustrate the best case and worst-case outcomes for NPV within the SCBA, considering variations in both price elasticity and population size. This variability is important because both price elasticity and population size in reality can deviate from the assumed values in the model. The blue line representing the best case NPV outcome, the orange line representing the worst-case outcome and the green line shows the expected NPV under reference scenario.

The best-case outcome (least negative NPV) is achieved when the combination of the lowest price elasticity (-0.09) and the lowest population growth (Lower limit 95% prognosis interval). The average Netto value per year is -€2.56 billion, this is a 41.2% difference compared to the reference.

The worst-case outcome (most negative NPV) is when the price elasticity is highest (-0.14) and population growth is highest (Upper limit 95% prognosis interval). The average Netto value per year is -€4.92 billion, this is a 13.0% difference compared to the reference.

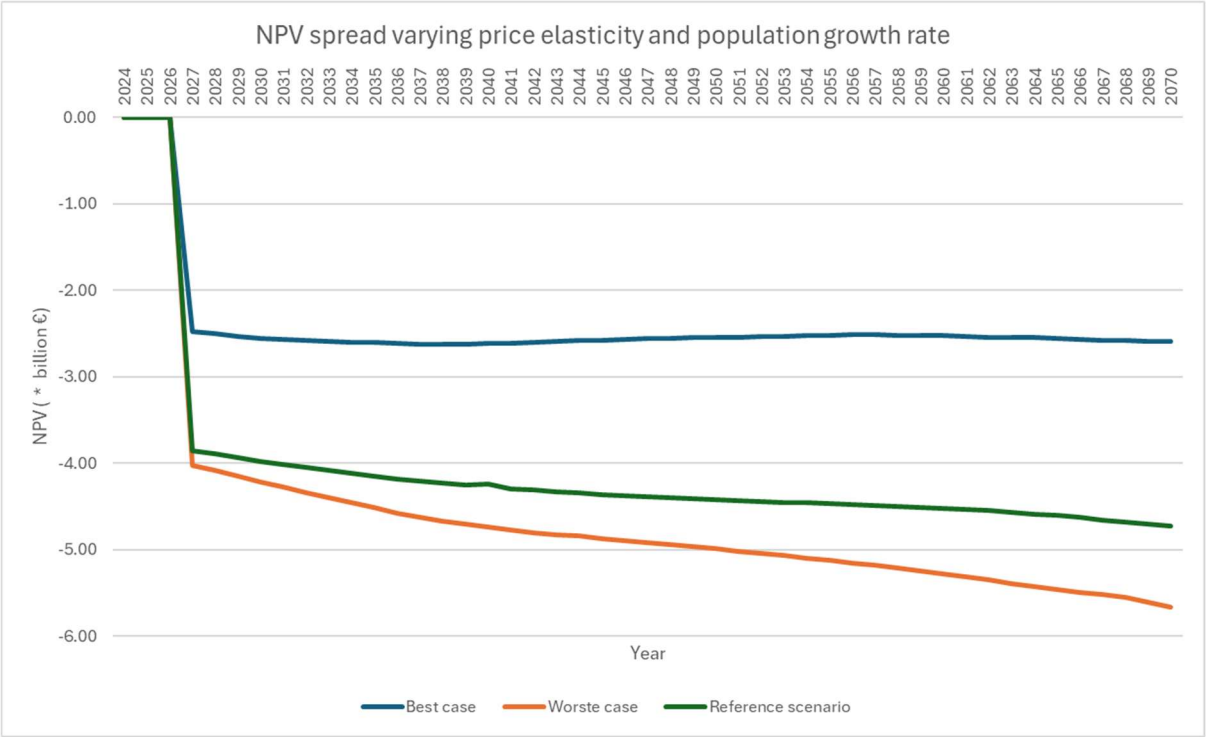

Figure 4.2: NPV spread varying price elasticity and population growth rate

Chapter 5: Discussion

5.1 Summary of key findings

This thesis conducted a comprehensive SCBA to evaluate the social consequences of different policy options related to the deductible within the Dutch Health Insurance Act. Four scenarios were examined: the abolition of the deductible, a reduction to €50, a reduction to €165 and the spread scenario,

The results show that all scenarios lead to a negative NPV, meaning that costs exceed benefits for all scenarios over the analysis period from 2027 to 2070. The Abolition scenario has the most negative impact on NPV, while the Reduction scenario up to €165 has the least negative impact. The Spread scenario is the chosen policy option by the coalition in the House of Representatives, although it results in a total NPV of -€192 billion over this period.

Because it involves annually recurring costs and benefits, in addition to the NPV over the entire 2027-2070 period, it is also useful to look at the average NPV over this period. Then we are talking about an average NPV of -€4.41 billion per year.

The sensitivity analysis shows that the SCBA results are particularly sensitive to variations in population size and price elasticity. Changes in these variables can lead to significant shifts in NPV, underscoring the need for accurate estimates and cautious interpretation of the results. The uncertainty analysis shows that variations in these factors can cause significant differences in NPV outcomes. In the worst-case scenario, the average NPV per year can reach -€4.92 billion and the best-case scenario can limit the average NPV per year to -€2.56 billion. This highlights the considerable uncertainty associated with these projections and emphasizes the need to carefully consider these factors in policy decisions.

In addition, it is also intersecting to look at the individual level. Indeed, ultimately the impact will be felt by the individual in society. This is an annual average NPV per person of -€275.03.

These findings show that while the Spread scenario is the policy option preferred by the House of Representatives, it has significant social costs that exceed the expected benefits.

5.2 Robustness of the model

The sensitivity analysis provides valuable insights into the robustness of the Social Cost-Benefit Analysis (SCBA) and the reliability of the results under variations in crucial input variables. Overall, the model appears to be robust for most of the variables examined, as changes in remain relatively small when input variables are adjusted by ±10%. This suggests that the welfare outcomes of the model do not depend heavily on small variations in these variables, providing confidence in the stability of the results under different conditions.

However, two variables -Population size and Price elasticity- show strong effects on NPV. A ±10% change in either of these variables results in a corresponding ±10% change in the NPV. This indicates a linear and proportional relationship, meaning that the reliability of the model is highly dependent on the accuracy of the estimates for these two variables. This sensitivity highlights the importance of careful data collection and accurate assumptions regarding population size and

price elasticity. Small deviations in the estimation of these variables can produce significant shifts in economic outcomes, indicating that the model is less robust to uncertainties in these parameters.

In contrast, the other variables show only minimal impact on NPV, with changes below 1%. This indicates a high degree of robustness in the model to uncertainties in QALY, the total amount of DBC and the Distribution deductible expenses on the NPV.

To remove the uncertainty around the variables: Population size and Price elasticity, an uncertainty analysis was done. This shows a spread of results about the NPV in the period 2027-2070. It can be said with less uncertainty that the annual average NPV will be between -€4.92 billion and -€2.56 billion. This shows that significant costs will be incurred in implementing the deductible spreading policy.

5.3 Explanation and plausibility of assumptions

This section separately explains the assumptions underlying the SCBA in this thesis and assesses them for plausibility:

1. Healthcare costs as proxy for healthcare usage: In this thesis, healthcare costs are used as a proxy for healthcare usage, due to the lack of detailed data on actual healthcare consumption. The premise is that higher healthcare costs typically indicate more intensive healthcare usage, making costs a practical proxy for determining the extent of care. This is partially plausible and supported by research showing that costs are often a good indicator of care intensity (Diehr et al., 1999). However, this approach also has limitations: healthcare costs can be affected by factors such as price differences, inflation, and the introduction of new, more expensive treatments, which are not always directly related to the actual use of healthcare services.

2. Relationship between population size and healthcare usage: This thesis assumes a direct relationship between population size and healthcare usage. Predictions of population size by age group for the period 2024-2070 are used to estimate healthcare usage via linear regression. This assumption is based on historical data showing a strong correlation between population growth and healthcare costs. This assumption is generally plausible and is supported by studies that show that demographic changes, such as aging, lead to higher healthcare demand (Mielczarek, 2021). Nevertheless, it must be recognized that this approach simplifies the complex and changing dynamics of healthcare needs, which may lead to oversimplification of the actual relationship between population growth and healthcare usage.

3. Linear price elasticity of healthcare usage (-0.14): The assumption of a linear price elasticity of -0.14 (Van Vliet, 2004) is based on the assumption that price changes have a predictable influence on healthcare usage: higher costs reduce healthcare usage, while lower costs lead to more usage. This elasticity provides a useful basis for predicting trends in healthcare usage with changes in the deductible. However, the linear approach is only partially plausible because it does not adequately reflect the complex behaviors of healthcare users. Responses to price changes are often not linear and can vary widely depending on factors such as income level and health status. As a result, there is a risk of overestimating or underestimating effects, especially for large deductible adjustments.

4. Health Benefits (QALY elasticity): The assumption is that an increase in healthcare usage leads to better health outcomes, measured in QALY. This relationship is modeled with an elasticity that originally describes the impact of additional investment in hospital care on reducing QALY loss. In this thesis, the increase in healthcare costs is seen as a proxy for these investments and

the reduction in QALY loss is interpreted as health benefits. While this provides a structured approach, the assumption is only partially plausible. Using an elasticity that links investment to QALY gains is not directly applicable to healthcare usage, as not all additional care contributes to significant health benefits. Moreover, demand for care may increase for services that contribute little to QALY improvements, potentially overestimating the true health benefits.

5. Constant distribution of deductible expenses (based on 2015 data): For forecasting future health care spending, it is assumed that the deductible distribution, as established in 2015, remains constant over time. This approach provides a consistent and simple basis for forecasting but does not take into account possible changes in health care consumption patterns over the years. While practical for modeling, it can lead to inaccuracies because it ignores the dynamic nature of healthcare usage. As a result, the assumption is partly plausible, but may be outdated and not fully representative of future trends.

6. No cost and care avoider groups: Within the deductible distribution, people without healthcare costs are divided into subgroups: those who do not need care, care avoiders because of costs, and care avoiders who do start using care due to policy changes. This classification helps to understand the different reasons why people do not incur healthcare costs within the deductible. However, the subgroups “Care avoiders due to cost” and “No more care avoiders (due to policy changes)” involve more uncertainties, due to the complexity of care avoidance and the varying responses to policy changes. While these assumptions are useful for modeling, it is important to recognize the limitations of these simplified categories, as they may not fully capture all the nuances of caregiving behavior.

7. Full deductible payers: People who use their full deductible are further divided into chronic healthcare users, healthcare users without additional treatments, and healthcare users with additional treatments. The distinction between users with and without additional treatments is based on the phenomenon of moral hazard: when healthcare costs become effectively “free” after reaching the deductible, people may be inclined to consume more care. The equal distribution between these subgroups was assumed in the absence of specific data, which leads to uncertainty and may not fully reflect the true distribution.

8. DBC duration, costs, and distribution: The assumption is that DBCs have a maximum duration of 120 days, that only one DBC can run at a time, and that the cost is usually higher than the current deductible. As a result, the deductible is often expected to be fully utilized when using one DBC. This classification helps identify trends in healthcare usage and predict the impact of policy changes on healthcare costs. While these assumptions provide a strong basis for modeling, they may not account for all the variations and exceptions that can occur in practice, such as varying DBC costs and utilization patterns.

5.4 Limitations

5.4.1 Limitations inherent in the methodology of SCBA

A major focus of this thesis is the limitations inherent in SCBA as a methodology. While SCBA provides a powerful tool for quantifying the costs and benefits of policy options, there are some fundamental limitations to this methodology that may affect the accuracy and completeness of the results.

One of the core limitations of SCBA is converting non-financial effects into monetary terms. This process requires assumptions and estimates that are sometimes difficult to substantiate, especially when intangible effects are involved. Another aspect of SCBA that can lead to

limitations is its focus on quantifiable effects. This can leave important qualitative aspects of policy changes underexposed.

This is reflected in some respects in this thesis, for example, healthcare usage based on healthcare costs and health benefits due to increased accessibility to healthcare were considered in this thesis. We also chose not to include Potential decline in quality of care. The increase in healthcare usage will result in an Increased workload for healthcare providers, causing pressure on healthcare capacity and a potential decline in quality of care.

Finally, SCBA as a methodology can impose limitations due to the simplifications required to model complex systems. In an effort to keep the analysis manageable and interpretable, certain interactions and dynamics within the healthcare system may be simplified or even omitted. This can lead to an underestimation of the complexity of the healthcare sector and its policy challenges.

5.4.2 Limitations of assumptions and data

In this thesis, assumptions and data quality play a role in the preparation of the SCBA. Assumptions vary widely in plausibility, which directly affects the reliability of the results. Some assumptions are well supported by the literature, providing a solid basis for analysis. However, many assumptions have limited plausibility, introducing uncertainties that affect the accuracy of the results. Non-plausible assumptions pose a significant risk because they can greatly distort the results.

In addition, data quality and availability are a significant limitation. The model is largely based on generalized data and averages, which means that important nuances may not be captured, leading to a simplified picture of reality. For example, the projection of future healthcare usage relies on historical data and population projections, which does not account for changing healthcare needs and behavioral patterns.

The sensitivity analysis showed that variables such as population size and price elasticity of healthcare usage have a large impact on outcomes. Small changes in these variables can have large impacts on the estimated costs and benefits of policy changes, underscoring the need for accurate and specific data. The data for care avoiders, chronic healthcare users, and QALYs, although not strong determinants of NPV in the SCBA, very important because policy views focus precisely on these variables.

5.4.3 Limitations of modeling approaches

A major limitation of this thesis lies in the use of linear regression models and elasticities to model the effects of policies on healthcare usage. While these approaches are useful for identifying general trends and quantifying the relationships between variables, they fall short in capturing the complex and nonlinear nature of healthcare usage and the varying behavior of healthcare users.

The use of linear regression assumes a constant relationship between the variables, with any change in the independent variable leading to a predictable, proportional change in the dependent variable. In reality, however, healthcare usage is subject to many other influences, such as patient health status, social determinants, and availability of care. These factors may

affect healthcare usage in different ways and to varying degrees, so the true impact of policy changes may not be fully reflected in linear models.

In addition, elasticities provide only a single estimate of how demand for care responds to price changes. Elasticities represent an average estimate often based on historical data and are unable to discern the nuances of individual behavioral patterns. However, healthcare users do not respond uniformly to price changes; some groups may be more sensitive to costs than others, depending on their specific circumstances such as income, health, or urgency of care needs. Relying on an average elasticity may not adequately capture the variability in responses among different subgroups.

These limitations mean that the models in this thesis may underestimate the dynamics and variability in healthcare usage, which may lead to simplified conclusions.

5.4.4 Limitations of specific errors identified in the model

During the analysis and modeling, some specific errors were identified that may affect the accuracy and interpretation of the results. These errors relate to assumptions and calculations within the model that may lead to a distorted view of the actual effects of policy changes.

1. Earlier healthcare usage and prevention of healthcare need

One of the main shortcomings of the current model is the lack of a mechanism to account for the possible long-term effects of improved accessibility to care on future care needs. All scenarios in this SCBA focus on improving access to care. A logical consequence of this could be that people receive care at an earlier stage. This early healthcare usage could prevent health problems from worsening, reducing the need for more intensive care pathways in the long term.

However, the model does not take into account the possibility that improved access and early interventions could lead to a decrease in future care needs. The scenarios assume that care needs remain constant regardless of any early care interventions. This means that the model fails to recognize that early and less intensive treatments may prevent a condition from worsening to a point where more intensive, costly care is needed.

This limitation may lead to an overestimation of future healthcare costs, as the model does not account for the potentially beneficial effects of preventive care and early interventions.

2. Effect of reaching the maximum deductible at lower thresholds (€50 and €165)

Another important flaw in the model concerns the way the effect of lower deductible thresholds, as in the reductions to €50 and €165, is modeled. In these scenarios, more people reach the maximum deductible more quickly, which may lead them to use more care after their deductible is filled, as follow-up treatments are then “free” for them.

However, the model does not adequately account for this potentially increased healthcare usage after the deductible is reached. In practice, this could lead to a significant increase in care consumption, because once people have used up their deductible, they may be less reluctant to seek additional care.

Current modeling may underestimate this effect, resulting in actual healthcare usage being estimated lower in these scenarios than they might actually be.
Not fully including this behavioral effect in the model may lead to an underestimation of both total healthcare costs and the burden on the healthcare system in the scenarios with a lower deductible. This means that the results of the SCBA may give an overly optimistic picture of healthcare costs and thus underestimate the impact on the higher costs of the nominal premium and income-dependent contribution. A more accurate analysis would require adjusting the model to better account for increased healthcare usage after reaching the maximum deductible in these scenarios.

A possible counterargument to this expected increase in healthcare usage, as people's deductibles fill up faster, is that a lower deductible increases access to care, making people less likely to wait until they fill up their deductible before seeking care. Since the initial cost of care is now lower, it may be less attractive for people to delay care. Instead, they would be more inclined to seek medical attention in time, reducing the incentive to delay care until the deductible is reached.

3. Misinterpretation of the inhibitory effect in the Spread scenario

In the Spread scenario, the model assumes that by spreading the deductible over multiple treatments, there will be a new inhibitory effect. This inhibitory effect would particularly affect people who used their full deductible in the base case and therefore underwent additional treatments at no additional cost. In the Spread scenario, these people would be inhibited in their healthcare consumption because each new treatment would cost them €50, rather than being free after reaching the deductible.

However, this assumption ignores an important financial difference between the base case and the Spread scenario. In the base case, people pay €385 to complete their deductible, after which they can receive multiple treatments at no additional cost. In the Spread scenario, these people pay €50 for the first treatment and another €50 for a second treatment. This brings their total cost to €100 for two treatments, which is significantly lower than the €385 they would pay in the base case. Moreover, even if these people proceed with a third treatment in the Spread scenario, they pay a total of €150, and after a fourth treatment €165. This total still remains lower than the amount they would have paid in the base case to use their full deductible. Thus, the model underestimates the likelihood that people will continue to use care, because their total costs in the Spread scenario remain lower even with multiple treatments than in the base case.

This error in modeling leads to an incorrect estimate of the inhibitory effect on healthcare usage in the Spread scenario. Instead of a substantial decrease in healthcare usage, as the model suggests, people may actually undergo more treatments because their total costs are lower than in the base case. This means that the model may underestimate total care utilization in the Spread scenario.

For a more accurate representation of the possible effects of the Spread scenario, the model would need to be adjusted to account for the fact that, despite the inhibition by the additional cost per treatment, the total cost for multiple treatments may still be lower in the Spread scenario than in the base case. This would give a more realistic picture of the possible increase in healthcare usage and its consequences.

4 Differences in the number of DBCs between the model and CBS data

An important error that emerges in the model concerns the difference between the estimated number of DBCs and the actual registered numbers as reported by CBS. This difference is consistently present throughout the historical period from 2011 to 2021 and continues in the future projections from 2024 to 2070.

The data analysis shows that the number of DBCs in the model is systematically lower than the CBS figures. In the historical period 2011-2021, the difference between the model and CBS data is significant, with underestimates ranging from -10.5% in 2011 to -21.3% in 2019. This pattern continues in the future projections, with the model showing an underestimate of -8.1% for the years 2024-2070.

This underestimation may have several causes. For example, the model makes assumptions about the percentage of people who will use one, two, or three DBCs,
where the percentage of people is based on known data, but the number of DBCs is reasoned and assumed. There can obviously be errors in this. If these assumptions deviate from actual trends in care consumption, this may lead to a structural underestimation of the total number of DBCs.

Despite this discrepancy, it was decided not to adjust or revise the model again because the sensitivity analysis shows that the model is not strongly dependent on the number of DBCs. The overall effects of policy changes continue to provide valuable insights even with the observed differences in DBC numbers. However, it is important to keep this error in mind when interpreting the results so that one is aware of the limitations, but without significantly affecting the overall conclusions about the impact of policy changes.

5.5 Application for practice

5.5.1 Capacity of resources

The Spread policy option is expected to lead to an increase in healthcare usage. A higher demand for care will put additional pressure on the supply of care, which may affect the capacity of the care sector.

An increase in healthcare usage requires adequate availability of resources: medical equipment, adequately qualified staff, and sufficient physical space within healthcare facilities. Without adequate expansion of these resources, there may be a risk of overburdening healthcare providers at the expense of the attention and quality of care patients receive. This can lead to longer wait times, increasing the likelihood that medical problems will worsen before they can be treated. In addition, the increased workload can contribute to an increase in burnout among health care personnel, further straining continuity and quality of care.

Ensuring adequate capacity, both in terms of personnel and infrastructure, is crucial to prevent increased demand from negatively impacting the delivery of care and ultimately the health of the population. This highlights the need for an integrated approach that considers not only the costs and benefits, but also the operational feasibility and necessary adjustments in care delivery.

5.5.2 More healthcare allowance due to increase nominal premium

In the Netherlands, care allowance is provided to people with an income below a certain limit to support them in paying for their healthcare costs. With the introduction of the new policy, both the nominal premium and the income-related contribution will increase. This means that a higher healthcare payment will be needed to keep healthcare costs affordable.

In the period 2011-2021, the total amount of care allowance provided varied between €3.899 billion and €5.473 billion (CBS Statline, 2022). This spending is expected to increase further due to rising healthcare costs resulting from new policies. This puts additional financial pressure on the government, which is responsible for funding this increasing care allowance. The rising spending on care allowance is financed by tax revenues, which means that the costs eventually return to society.

5.5.3 Confusion among healthcare users

In the Spread scenario, each treatment is determined with an annual cap. This introduces complexity compared to the current system of only an annual cap, it leads to confusion among healthcare users and administrative challenges for healthcare providers who must track and apply payments. This complexity of the Spread scenario can cause healthcare users to not fully understand how their costs are calculated.

Research by Salampessy, Alblas, Portrait, et al. (2018) shows that cost-sharing programs that are complicated and opaque, such as the Spread scenario, reduce price awareness among healthcare users and affect their willingness to follow recommended care. When people are uncertain about costs or how payments are applied, they are less likely to follow medical treatments or diagnostic tests recommended by their doctor. This can result in negative health outcomes, especially for those who avoid care because of ambiguities in cost-sharing programs. These findings show the effects of a complex deductible system on healthcare usage.

5.5.4 Critical consideration of the inhibitory effect in the spread scenario

One of the main goals of introducing the Spread scenario is to create a financial threshold for each individual treatment, with the goal of discouraging unnecessary healthcare usage. The idea is that by spreading the deductible over multiple treatments, healthcare users face a new cost threshold with each new treatment, which should have an inhibiting effect on their healthcare consumption.

However, as discussed earlier in this thesis, there are serious doubts about the effectiveness of this inhibitory effect. Indeed, in the Spread scenario, the cost per treatment is so low that even after multiple treatments, the total cost to healthcare users is still significantly lower than in the base case. This means that healthcare users are less financially inhibited from continuing to use care even if they undergo multiple treatments. Where in the base scenario a healthcare user would have to pay €385 in deductible and then receive further care for free, the same healthcare user in the Spread scenario, for example, pays only €150 after three treatments or €165 after four treatments. This is significantly lower than the amount in the base scenario, greatly reducing the financial incentive to avoid care.

This raises the question of whether the intended inhibiting effect of the Spread scenario actually works as intended. On the contrary, the lower cost per treatment may cause healthcare users to seek care more often because the total financial burden is less. As a result, instead of reducing healthcare usage, the Spread scenario could potentially lead to an increase in healthcare usage, which goes against the original intention of this policy.

To get a more realistic picture of the potential effects of the Spread scenario, the model should be revised to better reflect these dynamics. It is essential that policymakers are aware of this potential shortcoming so that they can make informed decisions about the implementation of this scenario within the Dutch healthcare system.

5.5.5 Net cost shift

The various policy options in the health care system all impose additional costs on society. There is an important distinction here between healthcare users and non-healthcare users. All citizens, regardless of healthcare usage, pay the increase in the nominal premium and income-related contribution. However, only healthcare users pay the deductible in addition. When the increase in the nominal premium and income-dependent contribution exceeds the reduction in the deductible, healthcare users do not benefit from the policy option compared to the base case. This is the case in all scenarios except Reduction €165; then the increase in costs is greater than the decrease in the deductible.

The goal of the Spread scenario is to reduce the burden on healthcare avoiders and chronic healthcare users. However, it is not the case that costs are lower for these groups compared to the base case. For care avoiders who currently do use care, the additional cost is €117.90[3] and chronic healthcare users pay as much as €232.90[4] more.

This analysis shows that although the policy lowers the threshold for healthcare usage and shifts the cost distribution somewhat, the financial benefits to healthcare users do not directly lead to a lower total cost burden in the Spread scenario. The increase in overall premiums ensures that costs ultimately fall on society as a whole, which calls for a critical evaluation of the effects of such policy options.

5.5.6 Appeals to solidarity

The Dutch healthcare system is based on the principle of solidarity, where non-healthcare users contribute to the healthcare costs of healthcare users. In the base case, healthcare users contribute €385 deductible to healthcare costs. If the deductible is lowered, as in the Spread scenario, this cost contribution shifts to non-healthcare users, who must compensate through higher nominal premiums and income-dependent contributions.

The goal of the Spread scenario was to reduce care avoidance by lowering the cost threshold and easing the financial burden on chronic healthcare users. This was partially achieved: the threshold to use care for care avoiders was lowered to €50 instead of €385, and the additional cost for chronic healthcare users was reduced to €165 instead of €385.

[3] Calculated as: €452.90 additional premium + €50 deductible - €385 initial deductible= €117.90
[4] Calculated as: €452.90 additional premium + €165 deductible - €385 initial deductible = €232.90

In the Spread scenario, however, the solidarity of non-healthcare users is significantly increased. Lowering the deductible means that non-healthcare users have to contribute more to the healthcare costs of healthcare users, which is done through an increased nominal premium and income-dependent contribution. The current nominal premium averages €1752 per year (Ministerie van Algemene Zaken, 2024b), and in the Spread scenario an average of €452.90 is added, an increase of 26%.

Research by the Nivel et al. (2024) shows that in 2023 about 75% of Dutch people were willing to contribute to the healthcare costs of others, but 25% were not willing to do so. The question is whether society's willingness for solidarity will remain as strong if nominal premiums rise sharply because of these policy changes. Such an increase in premium costs could lead to dissatisfaction among citizens, especially if they feel they are contributing disproportionately to the healthcare costs of others.

These findings call into question the sustainability of the solidarity principle in the health care system, especially if rising premium costs put pressure on the willingness to show solidarity. It is crucial to take into account society's ability and support in future policy decisions to maintain solidarity.

5.6 Comparison with other studies

5.6.1 Comparison with Remmerswaal and Boone (2020)

This section compares the results of this thesis, which employs a Linear Regression model, with those of a CPB study that utilizes a Bayesian Mixture Model. Understanding these methodological differences is crucial to assessing how different analytical approaches can influence predictions of healthcare costs and the impacts of policy changes.

Methodological differences

The Bayesian Mixture Model, as used in the CPB study, offers a more sophisticated approach to modeling healthcare costs by accounting for variability and uncertainty in individual healthcare usage. Unlike simpler methods, this model can manage the skewed distribution of healthcare expenses, often seen due to varying needs among population subgroups, such as chronic patients versus healthy individuals. By recognizing multiple distributions within the population, the Bayesian Mixture Model can more accurately predict the responses of different groups to policy changes, such as adjustments to deductibles.

In contrast, the Linear Regression approach used in this thesis assumes a straightforward, linear relationship between policy changes and healthcare costs. While this method is accessible and easier to implement, it does not capture the complex and non-linear nature of healthcare behavior, nor does it account for significant interactions between demographic and behavioral factors. Consequently, Linear Regression may oversimplify the relationship between variables, potentially leading to less accurate predictions.

Comparative results: abolition of deductibles

Both models assess the impact of abolishing deductibles on healthcare spending, but they yield markedly different outcomes. The Bayesian Mixture Model predicts an increase in healthcare spending of €2.14 billion, whereas the Linear Regression model forecasts a substantially larger increase of €4.83 billion. This discrepancy suggests that the Bayesian Mixture Model provides a more nuanced understanding by capturing individual-level variations and subgroup differences, which the Linear Regression model overlooks by applying a uniform effect across the entire population.

Comparative results: reduction of deductibles

When analyzing a scenario with a reduced deductible of €165 in the thesis and a reduced deductible of €285, the differences between the models remain evident. The Bayesian Mixture Model estimates a smaller increase in nominal premiums (€702 million) and a higher reduction in deductible expenses (€641 million) compared to the Linear Regression model, which predicts a nominal premium increase of €2.76 billion and a reduction in deductible expenses of €369 million. The Bayesian model's ability to capture how distinct subgroups—particularly those who might continue to avoid care despite lower costs—respond differently to policy changes likely accounts for these variations. The Linear Regression model, with its simplified assumptions, may underestimate the effects of nuanced behavioral responses.

Implications for policy analysis

The contrasting results between the Bayesian Mixture Model and Linear Regression underscore the importance of model choice in healthcare policy analysis. The Bayesian approach, with its ability to incorporate complex, non-linear behaviors and account for heterogeneity among population groups, tends to produce more precise and realistic estimates. However, it requires more detailed data and sophisticated computational methods, which can pose challenges in implementation.

Conversely, the Linear Regression approach, while more straightforward and resource-efficient, may fail to fully capture the diversity of responses within the population. This simplification can lead to significant overestimations or underestimations of the true impact of policy changes, particularly in scenarios involving heterogeneous behavioral responses.

Conclusion

This comparison highlights that while both models provide valuable insights, the Bayesian Mixture Model's capacity to model individual-level variability and complex interactions makes it a superior tool for accurately predicting the effects of healthcare policy changes. The findings from the Linear Regression model in this thesis should therefore be interpreted with caution, particularly where diverse behavioral responses are likely.

The analysis demonstrates that advanced modeling techniques, such as those employed by the Bayesian Mixture Model, are essential for capturing the full scope of impacts that policy changes can have on healthcare costs and utilization. This insight emphasizes the need for more sophisticated approaches in policy analysis to ensure that decisions are based on the most reliable and comprehensive data available.

5.6.2 Comparison with Klein et al. (2024)

This thesis conducts a SCBA, comparing effects based on estimates obtained through linear regression and price elasticities for healthcare costs and deductible expenditures. For comparison, the results of this thesis are juxtaposed with those of Klein et al. (2024), who applied a dynamic structural model of patient behavior to simulate similar effects. The conversion is in appendix 9.6.2.

The main differences between the methodologies of the two studies lie in the complexity and level of detail of the models. While this thesis focuses on identifying broader trends based on historical data and elasticities, Klein et al.'s model uses a wide range of demographic and behavioral variables to simulate the impact of cost-sharing policies in a more detailed and dynamic manner. This allows Klein et al.'s model to better predict subtle behavioral responses to policy changes.

The comparison of the results shows that although the direction of some effects in both studies is similar, the order of magnitude differs significantly. This difference can be attributed to their more complex methodology, which takes into account a wider variety of factors.

A notable exception is the “Spread” scenario, where the direction of effects in both studies is opposite. This difference highlights the limitations of using linear regression to model complex behaviors in healthcare. This is particularly relevant because the overall conclusion of Klein et al. is that policy options that introduce higher patient costs, such as an increased deductible, can be effective in reducing overall health care spending and health care premiums. This is because patients are less likely to use care when they have to pay more themselves. At the same time, it appears that such policies, such as spreading the deductible, do not necessarily increase the financial burden on patients, as out-of-pocket costs may decrease under certain scenarios.

Conclusion

This comparison shows that the use of linear regression, as applied in this thesis, may be too simplistic to fully estimate the complex dynamics of healthcare behavior. Klein et al.'s methodology, with its multilevel approach and detailed modeling, provides a more robust framework for understanding the impact of cost-sharing policies. This suggests that for a complete and accurate estimate of health care spending and patient behavior, a more complex methodology is desirable.

5.7 Recommendation follow-up research

The research in this thesis provided insights, but also revealed limitations and uncertainties that warrant further study. Based on the findings, some recommendations for follow-up research are presented here.

A first recommendation concerns a detailed demographic analysis. The research has shown that the results are highly sensitive to variations in population size and price elasticity. Future research could benefit from incorporating more detailed demographic data and examining specific subgroups within the population, such as the elderly, young people, or people with chronic conditions. Such analysis could better enable policymakers to design targeted and effective interventions that take into account the diverse needs of different populations.

In addition, there is a need for research that considers nonlinear behavioral responses to policy changes. Since current research models the relationship between deductibles and healthcare usage as linear, advanced methods, such as dynamic structural models or Bayesian mixture models, may lead to a more nuanced and accurate understanding of the effects of policy changes. Although previous research has focused primarily on the short-term, it is important to apply such analyses to the long-term as well to get a more complete picture of potential impacts.

Another important recommendation is to examine the effects of preventive care and early care interventions. A limitation of the current model is the lack of attention to the potential long-term effects of such interventions. Future research should focus on modeling the savings and health benefits that result from early interventions. This could help policymakers consider investments in prevention as a way to control overall healthcare costs and improve long-term public health.

The impact of an increase in healthcare demand on the capacity of the healthcare system also deserves further study. Research on how quickly the healthcare sector can scale up to meet increased demand, including the availability of healthcare personnel, infrastructure, and resources, is crucial. This can help avoid capacity problems, such as longer waiting times and limited access to care and ensure continuity of quality care.

In addition to capacity, it is also important to examine the effects of increased care demand on care quality. Higher workloads among caregivers may lead to decreased quality of care, as caregivers have less time for each patient and the likelihood of errors increases. Future research could look at the psychological and physical impact on caregivers and make recommendations for improving their working conditions to ensure quality of care even during times of increased demand.

Finally, follow-up research could focus on care avoiders' reactions to price reductions, such as a reduction in deductibles. Since current research suggests a relationship between price reductions and the reduction of care avoidance, a detailed analysis of how different groups of care avoiders respond to changed financial incentives could help policymakers reduce care avoidance and improve access to care.

In summary, future research should focus on integrating more detailed demographic analyses and examining nonlinear behavioral responses to better predict and optimize policy effectiveness. In addition, it is critical to examine the long-term effects of preventive care and early interventions, as well as the impact of increasing demand for care on both capacity and quality of care. These follow-up studies will contribute to a more nuanced and robust understanding of the impact of changes in the healthcare system, which is essential for making informed and sustainable policy decisions in the future.

Chapter 6: Conclusion

This thesis asked the primary research question, “What are the social costs and benefits of the policy change in the Dutch deductible to €50 per treatment with an annual maximum of €165, compared to the current system, for the entire Dutch society over the period 2027-2070?” The purpose of this research was to conduct a Social Cost-Benefit Analysis (SCBA) to evaluate the social impact of four specific policy options: the abolition of the deductible, a reduction to €50, a reduction to €165, and the spread scenario (€50 per treatment with an annual maximum of €165, which ultimately represents the policy option chosen by the Dutch government.

The analysis showed that all four scenarios considered lead to a negative Net Present Value (NPV), indicating that costs exceed benefits over the entire period of analysis (2027-2070). The scenario in which the deductible is abolished resulted in the most negative impact with an NPV of -€204 billion. On the other hand, the scenario in which the deductible is reduced to €165 had the least negative impact, with NPV of -€116 billion. The Spread scenario, chosen despite policy preference, produced a total NPV of -€194 billion, with an average annual NPV of -€4.41 billion. This suggests that the social costs, caused mainly by higher nominal premiums and income-related contributions, are significantly higher than the expected benefits, such as reduced spending on deductibles and health benefits from improved access to care.

Moreover, uncertainty around population size and price elasticity was included to express the spread of the results of the SCBA. This involved outlining a worst-case scenario in which costs are 13.0% higher, and a best-case scenario in which costs are 41.2% lower. This results in an average annual NPV ranging between -€4.92 billion and -€2.56 billion.

In the Spread scenario questions raise about the effectiveness of the intended financial threshold on healthcare usage. The analysis shows that the total costs for healthcare users in this scenario are often lower than in the base case, even after multiple treatments. This means that the financial threshold that should serve to reduce healthcare usage may not be effective. Instead of a decrease in healthcare usage, the Spread scenario may actually lead to an increase, as the lower cost per treatment encourages healthcare users to use care more.

This thesis has some limitations that may affect the interpretation of the results. In the SCBA methodology, all effects should be monetized, however, this is obviously not always possible, leading to imperfections. In addition, quantification in this SCBA simplified the complexity of healthcare systems and used assumptions and generalized data. Sensitivity analysis revealed that the model is particularly sensitive to variations in population size and price elasticity, suggesting that small changes in these variables can have a large impact on outcomes. In addition, specific model limitations were identified, such as the underestimation of healthcare usage after the deductible is met in the Spread scenario, which may have led to overly optimistic cost estimates. These limitations highlight the need for caution in interpreting the results and the importance of further research.

However, the spreading scenario, which aims to lower the burden for care avoiders and chronic healthcare users, does not result in these groups having lower costs compared to the current situation. Care avoiders who currently do use care pay an additional €117.90, and chronic healthcare users pay as much as €232.90 more. This shows that although the policy lowers the threshold and shifts costs somewhat, the financial benefits to healthcare users do not directly

lead to a lower total cost burden. The increase in premiums ensures that the burden ultimately falls on society as a whole, which calls for critical evaluation of the effects of such policy options.

The Dutch healthcare system is based on the solidarity principle, where non-healthcare users contribute to healthcare costs of healthcare users. In the current situation, healthcare users contribute €385 deductible to healthcare costs. When the deductible is reduced, as in the spread scenario, this cost contribution shifts to non-healthcare users, who must compensate via higher nominal premiums and income-dependent contributions. Although the spread scenario partially succeeds in reducing care avoidance by lowering the threshold to €50 per treatment and limiting the cost for chronic care users to €165, solidarity from non-healthcare users increases significantly. The average nominal premium increases by €452.90 per year, an increase of 26%, which raises the question of whether the willingness for solidarity in society remains strong enough if premiums rise sharply due to this policy. A sharp increase in premiums could lead to discontent in society, especially if they feel they are contributing disproportionately to the healthcare costs of others. These findings raise questions about the sustainability of the solidarity principle in the health care system in the Spread scenario, especially if rising premium costs put pressure on the willingness to show solidarity.

At the introduction of this study, the research question was asked, “What are the social costs and benefits of the policy change in the Dutch deductible to €50 per treatment with an annual maximum of €165, compared to the current system, for the entire Dutch society over the period 2027-2070?” This analysis showed that the Spread scenario has a negative NPV and thus significant costs for society. There will be a smaller gap in paying for care between healthcare users and non-healthcare users, this making a great appeal to the solidarity of Dutch society.

Chapter 7: Reference list

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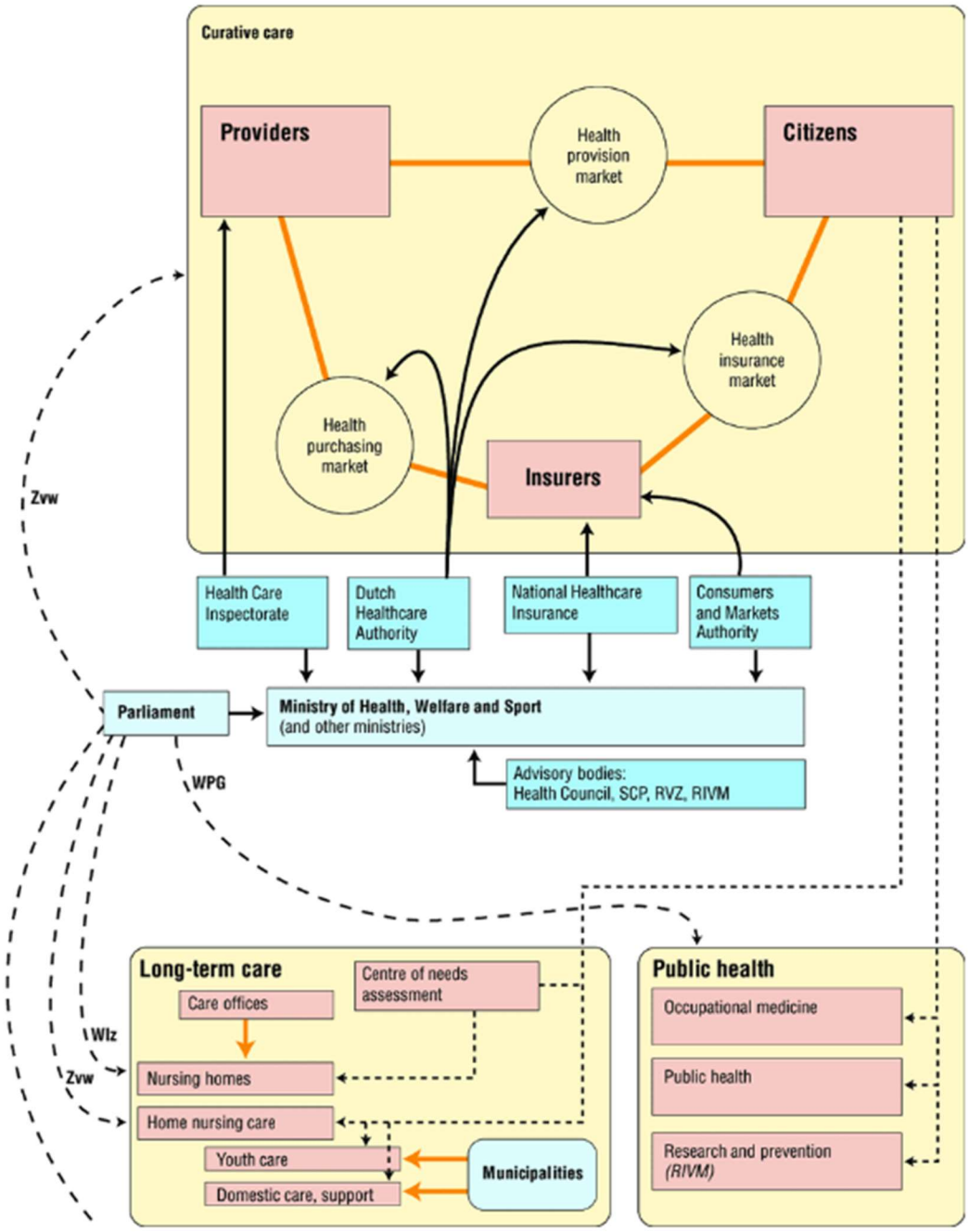

1 Organizational overview of the Dutch healthcare

Figure 8.1.1: Organizational overview of the Dutch healthcare (Kroneman et al., 2016)

8.2 Additional tables

Table 8.2.1: Overview of key actors in the health insurance act framework and their relevance to the deductible

Actor	**Role in the Healthcare System**	**Relevance to the deductible**
Providers	Hospitals, general practitioners, and specialists deliver healthcare services to patients.	Affected by the deductible as it influences patient access to healthcare and can impact their revenue streams. Providers can also influence policy through professional associations and discussions with policymakers. (Kroneman et al., 2016)
Citizens/Patients	Fund healthcare through taxes and premiums and use healthcare services.	Citizens are the primary payers of the deductible. They can be classified into three categories: people with no cost, with a deductible below €385, and with a deductible above €385. This classification helps in understanding how separate groups manage their healthcare costs. (Zorgverzekeraars Nederland, 2023; TNS NIPO, 2016; Patiëntenfederatie, 2024)
Health insurers	Implement the health insurance system and manage the deductible.	Directly affected by policy changes related to the deductible as they influence their operations and cost management. (Zorgverzekeraars Nederland, 2023)
Parliament	Legislative body that determines healthcare policy through laws and regulations.	Plays a crucial role in shaping the policy around the deductible through legislative processes. (Kroneman et al., 2016)
Ministry of Health, Welfare and Sport (VWS)	Responsible for overall health policy in the Netherlands, including health insurance and the deductible.	Sets policies and regulations that define the scope and application of the deductible. (Ministerie van Volksgezondheid, Welzijn en Sport, 2024a)
Healthcare Inspectorate (IGJ)	Monitors public health and ensures safety and quality of healthcare facilities and services.	Ensures compliance with laws and regulations related to healthcare, including those concerning the deductible. (Inspectie Gezondheidszorg en Jeugd & Ministerie van Volksgezondheid, Welzijn en Sport, 2024)

Dutch Healthcare Authority (NZa)	Oversees and regulates healthcare markets, including health insurance.	Advises the government on regulations related to the deductible and ensures that healthcare remains accessible, affordable, and of high quality. (Nederlandse Zorgautoriteit & Ministerie van Volksgezondheid, Welzijn en Sport, 2024)
Netherlands Healthcare Institute	Administers the Health Insurance Fund and manages financial resources for the Health Insurance Act.	Ensures that funds are available to cover the costs incurred by health insurers for basic insurance, which includes managing the financial implications of the deductible. (Ministerie van Volksgezondheid, Welzijn en Sport, 2024)
Consumers and Markets Authority (ACM)	Ensures fair competition and protects consumer interests.	Oversees market forces in healthcare to ensure that consumers have choice and that there is fair competition among health insurers. (ACM, 2024)
Advisory Bodies (Health Council, SCP, RVZ, RIVM)	Provide independent advice and scientific insights to support health policymaking.	Offer recommendations and research findings that can influence policy decisions related to the deductible. (Kroneman et al., 2016)

8.3 Data

8.3.1 Forecasted healthcare usage

To calculate future healthcare usage, the healthcare usage from 2011-2021 and the population size from 2011-2021 were examined. Then the forecasted population size from 2027-2070 was examined to predict healthcare usage from 2027-2070.

8.3.1.1 Healthcare usage 2011-2021

The base case looks at current healthcare usage and how it is expected to develop in the period between 2027 and 2070. Data sets on healthcare costs in the Health Insurance Act for all insured persons in the Netherlands between 2011 and 2021 (Vektis, n.d.-a up to n.d. -l) are used for this purpose. The data provide insight into healthcare usage by healthcare type, broken down by age groups and reflected in healthcare costs of insured persons. It is assumed that healthcare usage can be expressed in healthcare costs. Based on these data, healthcare usage by age group can be determined. For this study, we looked at all persons aged 18 and over.

Healthcare usage is known for the period 2011 to 2021. To make a prediction for healthcare usage for the period 2027 to 2070, population growth in the Netherlands is considered. This assumes that healthcare usage depends on population size and that it grows proportionally over time.

8.3.1.2 Population size

The population size for persons over 18 years of age from 2011 to 2023 is known from CBS (CBS Statline, 2024). There is a strong correlation between healthcare usage and population size from 2011 to 2021, with a correlation coefficient of 0.968. CBS has forecasted population growth from 2024 through 2070, with data on the estimated number of people by age (CBS Statline, 2023). Figure 3.3 shows the population size of people over the age of 18, with the measured population size for the period 2011-2023 shown in orange, the forecasted population size for the period 2024-2070 shown in blue and the transition from available to forecasted data, 2023 to 2024 in green.

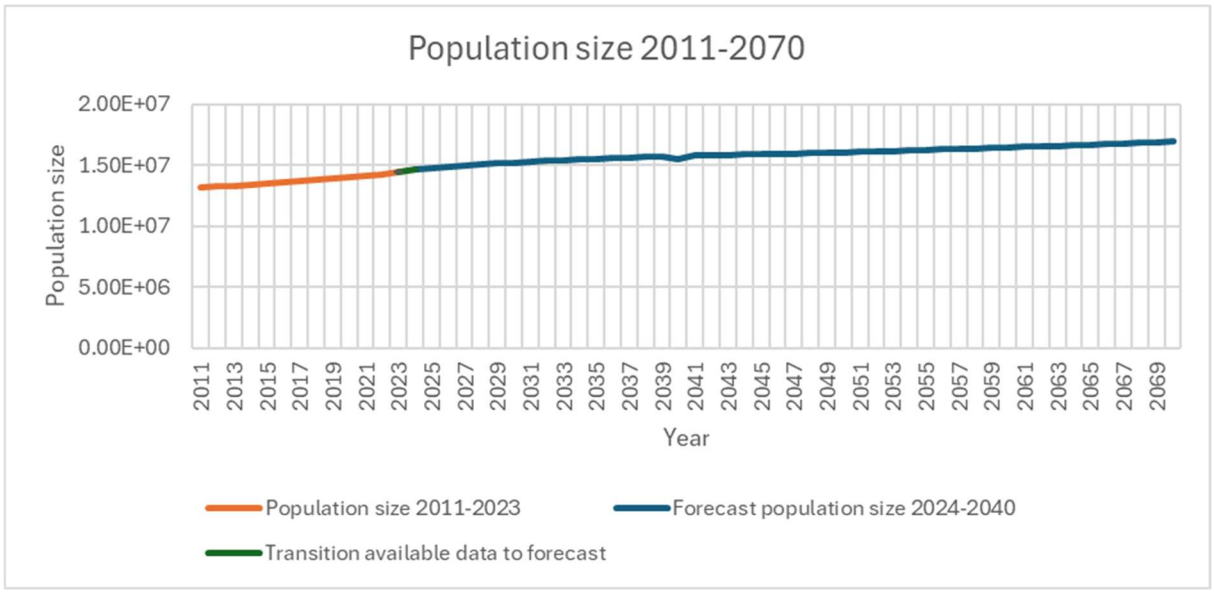

Figure 8.3.1: Population size 2011-2070

8.3.2 Distribution of deductible expenses in society

After determining healthcare usage, it is important to know how deductible usage is distributed across society. The deductible is currently €385. However, not everyone uses up the full deductible. For this study, it is crucial to know how many people use the full deductible, how many people do not use the deductible at all, and how many people use the deductible partially.

Data on the distribution of deductible usage is available for the year 2015 from Vektis (2017). This data provides a detailed overview of deductible spending patterns, shown as percentages of different group sizes. More data is available from other years, but the 2015 data was chosen because of its level of detail. The appendix further explains why this choice was made.

In using these data, it is assumed that the distribution of deductible spending will remain the same in the future. The data provide ranges within which deductible spending falls, and in order to use these data, the middle of each range was taken as representative spending on deductibles.

Table 8.3.2 shows the distribution of deductible spending in 2015. As an example, 45.0% of people used up their entire deductible of €385.

Table 8.3.2: Distribution of deductible usage

Label	**Range of deductible expenses**	**Average expense (€)**	**Percentage of society (%)**
Non-healthcare users	No costs	€0	19.1%
Healthcare users €50	€0 - €100	€50	19.7%
Healthcare users €150	€100 - €200	€150	8.2%
Healthcare users €250	€200 - €300	€250	5.2%
Healthcare users €337.50	€300 - €375	€337.50	2.9%
Healthcare users full deductible	Full deductible	€385	45.0%

Identifying this distribution helps to better understand how deductibles are used within different population groups. This is essential for modeling the effects of policy changes on different segments of the population in the SCBA.

8.3.2.1 Deepening the distribution of deductible usage in society

To further understand the distribution of deductibles, the different groups are now discussed. Here 3 core groups are distinguished:

1. Non-healthcare users, people who do not use care and therefore do not incur deductible expenses.
2. Healthcare users with partial deductible expenses, healthcare users who use care but not so much that the deductible is filled up.
3. Healthcare users with full deductible expenses, healthcare users who use so much care that the deductible is full.

1. Non-healthcare users

The first group of non-healthcare users can again be divided into two groups: people not in need of care, simply because they are not in need of it and care avoiders, people who are in need of care but still avoid it. There are different reasons for avoiding care, one of them may be to avoid care because of financial reasons. (Van Esch et al., 2015) The findings show that 15% of the population avoids GP visits, and 21% of this group does so because of expected follow-up costs (3.15% of the total population). Similarly, Meijer et al. (2023) found that 3% of the population avoids GP visits due to expected follow-up costs and 1% due to costs. Given the robustness and detailed findings of Van Esch et al. (2015), this study will use the figure of 3.15% to represent the portion of the population that avoids care due to cost considerations. The choice of this figure is further explained in Appendix 8. 3..

For this study, it was considered care avoiders, and it was assumed that these people do not use care at all. Therefore, all care avoiders are considered part of the group of non-healthcare users. This need not be the case, in reality there will of course be more care avoiders, namely care avoiders, who have used care, but not for everything and therefore avoid some. For this study, we focused on care avoiders, who do not incur any deductible costs at all.

It is also assumed that the number of care avoiders who will use care services decreases linearly from 3.2% with the current deductible to 0% without a deductible. So, with a reduction of the deductible to €50, 0.4% will still be care avoiders and 2.7% will no longer be care avoiders.

In addition, it is assumed that the percentage of the population that is care avoiders remains constant over time, based on the consistency between Van Esch et al. (2015) and Meijer et al. (2023).

Thus, the group of care avoiders is 3.2% of society, meaning that the people not in need of care consist of 19.1% - 3.2% = 16.0% (round up). After implementing a policy change, the deductible will decrease, thus the group of care avoiders will become lower, no care avoider anymore. In the base case nothing changes, therefore this group is 0%.

To create clarity, table 8.3.2 has been updated in table 8.3.3 with the additions about non healthcare users.

Table 8.3.3: Distribution of deductible usage

Label	Range of deductible expenses	Average expense (€)	Percentage of society (%)
People not in need of care	No costs	€0	16.0%
Care avoiders	No costs	€0	3.2%
No care avoider anymore	No costs	€0	0%
Healthcare users €50	€0 - €100	€50	19.7%
Healthcare users €150	€100 - €200	€150	8.2%
Healthcare users €250	€200 - €300	€250	5.2%
Healthcare users €337.50	€300 - €375	€337.50	2.9%
Healthcare users full deductible	Full deductible	€385	45.0%

2. Healthcare users with partial deductible expenses

For this group there is no further explanation and deepening needed. Here it is just about the 4 groups: Healthcare users €50, Healthcare users €150, Healthcare users €250 and Healthcare users €337.50.

3. Healthcare users with full deductible expenses

Last is the group of healthcare users, who use the entire deductible. This group consists of three types of people:

1. Chronic healthcare users, these are healthcare users who suffer from a chronic disease and are therefore constantly in need of care.
2. Healthcare users with non additional treatment, these are healthcare users who stop using care after exhausting the deductible because they are no longer in need of care, for example.
3. Healthcare users with additional treatment, these are healthcare users who start using additional care after the deductible has been used up.

The estimate of the size of the group of chronic healthcare users is based on data on contacts with general practitioners for chronic conditions during the period 2011-2021. This information is available through De Staat van Volksgezondheid en Zorg (2023) and reflects the prevalence of chronic conditions in the Netherlands in a number of persons.

Because the population size of these years is known through CBS Statline (2024), the percentage per year of people with a chronic condition can be calculated. On average, 30.7% of the population has annual contact with a general practitioner's office for a chronic condition, with extremes ranging from 29.2% to 31.4% (Chronic Disorder: Number of Persons in Care at the GP, 2023). In addition to the data over time, the data (Chronic Condition: Number of Persons in Care at the GP, 2023) also provides insight into the distribution of chronic conditions by age group. This allows a detailed picture to be drawn by age group, which is discussed in more detail in Appendix 8.3.2.

Then there are the healthcare users with non additional treatment and the healthcare users with additional treatment. There is no data on these groups, but because they need to be included in this study, the group is split in half to see the impact.

This gives the following distribution: healthcare users full deductible is 45.0%. Of these, 30.7% are estimated to have a chronic condition. This brings healthcare users with non additional treatment and the healthcare users with additional treatment together to 14.2% (rounding) and if these are divided equally to 7.1% for healthcare users with non additional treatment and the healthcare users with additional treatment.

To create clarity, table 8.3.2 and table 8.3.3 have been updated in table 8.3.4 with the additions about non healthcare users.

Table 8.3.4: Distribution of deductible usage

Label	Range of deductible expenses	Average expense (€)	Percentage of society (%)
People not in need of care	No costs	€0	16.0%
Care avoiders	No costs	€0	3.2%
No care avoider anymore	No costs	€0	0%
Healthcare users €50	€0 - €100	€50	19.7%
Healthcare users €150	€100 - €200	€150	8.2%
Healthcare users €250	€200 - €300	€250	5.2%
Healthcare users €337.50	€300 - €375	€337.50	2.9%
Chronic healthcare users	Full deductible	€385	30.7%
Healthcare users with non additional treatment	Full deductible	€385	7.1%
Healthcare users with additional treatment	Full deductible	€385	7.1%

8.3.2.2 Diagnosis treatment combination examination

Diagnosis-Treatment Combinations (DBCs) are codes that link care activities in hospitals to diagnoses and treatments. These systems promote transparency and efficiency in healthcare. DTCs contain information on diagnoses, treatments and follow-ups and help hospitals and insurers negotiate prices and quality. They form the basis for hospital bills and are divided into regulated and free segments, depending on negotiating opportunities between hospitals and health insurers.

Relationship DBCs to Deductibles

Part of the healthcare costs under DBCs are offset against the patient's deductible. This means that the patient must first pay part of the costs himself until the deductible amount is reached, after which the health insurer takes over the costs.

Duration of a DBC

A DBC lasts a maximum of 120 days (Patiëntenfederatie Nederland, s.d.), here it is assumed that you can have one DBC at a time so an individual can have a maximum of three DBCs per year.

Cost of DBCs.
Most DBCs (90%) are more expensive than €385, exceeding the deductible of €385. (Nederlandse Zorgautoriteit, 2024) That means that generally when using a DBC, the deductible is fully consumed immediately.

Categorization of distribution of deductible usage
In the model healthcare usage is categorized as follows:

- Individuals with healthcare costs below €385: assumed to have used one DBC.
- Healthcare users with non additional treatments: assumed to have used one DBC above €385.
- Healthcare users with additional treatments: assumed to have used two DBCs.
- Chronic healthcare users: assumed they used three DBCs per year, reflecting their continuous care needs.

These assumptions are crucial for analyzing healthcare usage and help quantify effects. However, it is important to recognize that these assumptions are preliminary and need to be refined as more detailed data become available. Table 3.5 adds the DBCs to the distribution of deductible usage, thus completing the overview.

Table 8.3.5: Total overview distribution of deductible usage

Label	Range of deductible expenses	Average expense (€)	Percentage of society (%)	DBC
People not in need of care	No costs	€0	16.0%	0
Care avoiders	No costs	€0	3.2%	0
No care avoider anymore	No costs	€0	0%	1
Healthcare users €50	€0 - €100	€50	19.7%	1
Healthcare users €150	€100 - €200	€150	8.2%	1
Healthcare users €250	€200 - €300	€250	5.2%	1
Healthcare users €337.50	€300 - €375	€337.50	2.9%	1
Chronic healthcare users	Full deductible	€385	30.5%	3
Healthcare users with non additional treatment	Full deductible	€385	7.2%	1
Healthcare users with additional treatment	Full deductible	€385	7.2%	2

After defining and expressing all the data in the groups, this can be pulled through to all the age groups this is shown in table 8.3.6.

Table 8.3.6 Complete overview distribution of deductible usage by age

	People not in need of care	Care avoiders	No care avoider anymore	Healthcare users €50	Healthcare users €150	Healthcare users €250	Healthcare users €337.50	Healthcare users with non additional treatment	Healthcare users with additional treatment	Chronic healthcare users
DBC	0	0	1	1	1	1	1	1	2	3
Total	16.0%	0.4%	2.7%	19.7%	8.2%	5.2%	2.9%	7.1%	7.1%	30.7%
18-24 years	26.4%	0.4%	2.7%	28.7%	8.5%	4.8%	2.7%	11.4%	11.4%	3.0%
25-29 years	28.1%	0.4%	2.7%	25.4%	8.2%	5.0%	2.7%	12.1%	12.1%	3.2%
30-34 years	24.8%	0.4%	2.7%	25.3%	8.6%	5.2%	2.9%	13.2%	13.2%	3.7%
35-39 years	23.2%	0.4%	2.7%	25.8%	8.4%	5.0%	2.8%	13.7%	13.7%	4.4%
40-44 years	21.6%	0.4%	2.7%	25.3%	8.6%	5.0%	2.7%	14.1%	14.1%	5.5%
45-49 years	19.2%	0.4%	2.7%	23.8%	8.9%	5.2%	2.8%	14.9%	14.9%	7.1%
50-54 years	15.6%	0.4%	2.7%	21.1%	9.1%	5.5%	3.0%	16.5%	16.5%	9.6%
55-59 years	11.8%	0.4%	2.7%	18.1%	9.4%	5.9%	3.2%	18.1%	18.1%	12.3%
60-64 years	7.8%	0.4%	2.7%	14.4%	9.0%	6.0%	3.3%	20.5%	20.5%	15.5%
65-69 years	4.6%	0.4%	2.7%	11.2%	8.3%	5.9%	3.4%	22.5%	22.5%	18.5%
70-74 years	2.1%	0.4%	2.7%	7.7%	6.8%	5.3%	3.2%	25.2%	25.2%	21.4%
75-79 years	0.6%	0.4%	2.7%	5.2%	5.1%	4.4%	2.8%	27.7%	27.7%	23.5%
80-84 years	0.5%	0.4%	2.7%	3.5%	3.9%	3.5%	2.3%	29.2%	29.2%	24.8%
85-89 years	1.9%	0.4%	2.7%	2.9%	3.2%	2.8%	2.0%	29.5%	29.5%	25.1%
90+ years	5.4%	0.4%	2.7%	3.1%	3.1%	2.5%	1.8%	27.9%	27.9%	25.1%

8.3.2.3 Care avoiders

As discussed in section 2.4.3 Differentiating healthcare users and non-healthcare users in society, within the group of non-healthcare users a distinction can be made between people who do not need care and people who need care but do not use it. The latter group is called care avoiders. Care avoidance can have several causes, including financial reasons, where care is considered too expensive. Therefore, this study distinguishes between non-care avoiders and care avoiders.

Several studies have been conducted on the prevalence of care avoidance in the Netherlands, particularly focusing on avoidance of care or GP visits due to cost. Although GP visits are free, it is assumed that care avoiders avoid GP care because of expected follow-up costs within the deductible of the health insurance act.

Analysis of different research

Van Esch et al. (2015): This study is considered highly dependable due to its extensive data collection methods, including questionnaires, interviews, and registration data from general practitioners and Vektis. It involved a large sample size of 4,473 respondents with a net response rate of 54.2%. Corrections for underrepresentation were applied to ensure representativeness, making the findings robust. The findings that 15% of the population avoids GP visits, and 21% of

this group does so because of cost (3.19% of the total population), are statistically significant ($p<0.05$).

Meijer et al. (2023): This study offers recent and reliable insights with a sample size of 1,500 respondents and a response rate of 44%. The detailed questionnaires and representative sample, combined with corrections for representativeness, contribute to the reliability of the results. This research shows that 3% of the population avoids GP visits due to expected follow-up costs and 1% due to costs, which is consistent with earlier findings.

Limitations of some research

TNS NIPO (2016), Van der Schors et al. (2016), and Kooijman et al. (2017): While these studies provide valuable insights, they are excluded due to several methodological limitations. The TNS NIPO study had a smaller sample (812 respondents), and although representative, it offers less statistical certainty. The study by Van der Schors et al. had an even smaller sample (616 respondents) and a lower response rate (41%), reducing the robustness of the results. Kooijman et al. had a larger sample (1,500 respondents) and a reasonable response rate (45%), but the detailed and statistically significant findings of Van Esch et al. (2015) and Meijer et al. (2023) make these studies more suitable for this analysis.

Results from Van Esch et al. (2015) and Meijer et al. (2023)

According to Van Esch et al. (2015), 15% of the population avoids GP visits, with 21% of this group doing so because of cost or expected follow-up costs. This equates to 3.19% of the total population. Similarly, Meijer et al. (2023) found that 3% of the population avoids GP visits due to expected follow-up costs and 1% due to costs. Given the robustness and detailed findings of Van Esch et al. (2015), this study will use the figure of 3.19% to represent the portion of the population that avoids care due to cost considerations.

8.3.2.4 Chronic healthcare users

The estimate of the size of the group of chronic healthcare users is based on data on contacts with general practitioners for chronic conditions during the period 2011-2021. This information is available through the State of Public Health and Care and provides insight into the prevalence of chronic conditions in the Netherlands (Chronic Disorder: Number of Persons in Care at the GP, 2023).

These data are presented in table 8.3.7, which shows the number of chronic healthcare users between 2011 and 2021. By comparing these figures with CBS population size data, it is possible to determine what percentage of the population can be considered chronic healthcare users.

On average, 30.7% of the population has annual contact with a general practice for a chronic condition, with rates ranging from 29.2% to 31.4% during the period 2011-2021, as shown in table 8.3.7. This shows that there is little variation over time, so the average of 30.7% is taken as the standard for the period 2027-2040.

Table 8.3.7: Prevalence of chronic conditions in the Netherlands (2011-2021)

Year	Chronic healthcare users	Population size	Percentage Chronic healthcare users
2011	4,865,800	16,655,799	29.2%
2012	5,165,800	16,730,348	30.9%
2013	5,053,000	16,779,575	30.1%
2014	5,232,000	16,829,289	31.1%
2015	5,175,400	16,900,726	30.6%
2016	5,321,200	16,979,120	31.3%
2017	5,298,700	17,081,507	31.0%
2018	5,388,700	17,181,084	31.4%
2019	5,408,100	17,282,163	31.3%
2020	5,187,800	17,407,585	29.8%
2021	5,329,000	17,475,415	30.5%

In addition to prevalence data for the period 2011-2021, data are also available on the distribution of chronic healthcare users by age and gender (Chronic Disease: Number of Persons in Care at the GP, 2023). These data are presented in table 8.3.8. By averaging men and women and relating this to the overall rate of 30.7% of the population, the percentage of chronic healthcare users by age group can be determined.

Table 8.3.8: Distribution of Chronic healthcare users by age group

Age	**Absolute per 1000 persons**		**Percentage**		**Average percentage**	**Percentage relative to population**
	Men	*Women*	*Men*	*Women*		
0 t/m 4 years	137	119.9	13.7%	12.0%	12.8%	3.9%
5 t/m 9 years	96	92.5	9.6%	9.3%	9.4%	2.9%
10 t/m 14 years	93.1	95.9	9.3%	9.6%	9.5%	2.9%
15 t/m 19 years	84.3	104	8.4%	10.4%	9.4%	2.9%
20 t/m 24 years	80.6	115.3	8.1%	11.5%	9.8%	3.0%
25 t/m 29 years	88	121.2	8.8%	12.1%	10.5%	3.2%
30 t/m 34 years	98.7	142.9	9.9%	14.3%	12.1%	3.7%
35 t/m 39 years	119.1	165.1	11.9%	16.5%	14.2%	4.4%
40 t/m 44 years	155	200.6	15.5%	20.1%	17.8%	5.5%
45 t/m 49 years	213.1	253	21.3%	25.3%	23.3%	7.1%
50 t/m 54 years	292.1	336	29.2%	33.6%	31.4%	9.6%
55 t/m 59 years	385.9	418.9	38.6%	41.9%	40.2%	12.3%
60 t/m 64 years	494.8	514.9	49.5%	51.5%	50.5%	15.5%
65 t/m 69 years	599.7	610.2	60.0%	61.0%	60.5%	18.5%
70 t/m 74 years	693.3	701.4	69.3%	70.1%	69.7%	21.4%
75 t/m 79 years	762.6	769.8	76.3%	77.0%	76.6%	23.5%
80 t/m 84 years	803.6	814.5	80.4%	81.5%	80.9%	24.8%
85+ years	815.1	824.7	81.5%	82.5%	82.0%	25.1%

8.3.3 Price elasticity

The change in healthcare usage depends on the demand for healthcare, which is influenced by the perceived price for healthcare users, determined by the level of the deductible. However, the extent to which healthcare usage changes due to changes in deductible levels can be quantified by the price elasticity of demand. In this study, the price elasticity of -0.14, determined by Van Vliet (2004), will be applied to estimate changes in healthcare usage based on changes in the deductible. This elasticity value represents a weighted average across various types of healthcare and provides a useful measure for this analysis. By applying this elasticity, the analysis can accurately reflect expected responses in healthcare demand due to policy changes.

Table 8.3.9 presents the results from Van Vliet (2004), showing the estimated price elasticity for different types of healthcare.

Table 8.3.8: Price elasticity by type of healthcare (Van Vliet, 2004)

Type of care	**Estimated price elasticity**
General Practitioners	-0.4
Physiotherapy	-0.32
Medicine	-0.08
Specialist care	-0.12
Hospital	-0.04
Other	-0.21
Total	-0.14

For example, the study found that a 1% increase in the price of hospital care results in a 0.04% decrease in healthcare usage. Conversely, this study applies the relationship in reverse: a 1% decrease in the cost of hospital care results in a 0.04% increase in healthcare usage.

It is important to note that GP care is not covered by the deductible. Nevertheless, Van Vliet included this type of care in the analysis because the study expects the use of GP care to increase if the deductible is reduced or eliminated. This is explained by the role of general practitioners as gatekeepers in the Dutch healthcare system; people first go to the GP for a referral to a specialist. Therefore, changes in the deductible will still have a significant impact on GP care. The overall elasticity of -0.14 is a weighted average of the diverse types of care (Van Vliet, 2004).

In this study, Van Vliet's (2004) elasticity value of -0.14 will be applied to estimate changes in healthcare usage based on changes in the deductible. In Van Vliet's (2004) study, this number is weighted for the mean, making it useful for this thesis. This method ensures that the analysis accurately reflects expected responses in healthcare demand due to policy changes.

8.4 Discussion calculations

8.4.1 Conversions and comparisons Remmerswaal and Boone (2020)

In order to accurately compare the results of this thesis with those of Remmerswaal and Boone (2020), it was necessary to make some adjustments and calculations. The original data of my study show average annual effects for the period 2027-2070. To facilitate comparison, I converted the results to a comparable level to Remmerswaal and Boone's results, which focus on the year 2022.

Table 8.4.1: Corresponding scenarios and variables

	Remmerswaal	**Thesis**
Scenario	Current situation	Base case
	Geen eigen betalingen	Abolition
	Mandatory deductible €285	Reduction €165
Variables	Change revenue own payments	Deductibles expenses
	Change total health insurance act expenditure	Nominal premium and income dependent contribution minus deductible expenses

The tables below present the results of the “Abolition” and “Reduction €165” scenarios in my study alongside those of Remmerswaal and Boone (2020). These have been converted to allow direct comparison.

Table 8.4.2: Converted results of thesis (2027-2070, average per year)

	Abolition	**Reduction €165**
Deductibles expenses	€3.66 billion	€0.37 billion
Nominal premium and income dependent contribution	-€8.48 billion	-€3.12 billion

Table 8.4.3: Results of Remmerswaal and Boone (2022)

	No co-payments	**Mandatory deductible €285**
	Abolition	**Reduction €165**
Change total health insurance act expenditure	€2.14 billion	€0.702 billion
Nominal premium and income dependent contribution minus deductible expenses	€4.83 billion	€2.76 billion
Change Revenue Own Payments	€3.18 billion	€0.641 billion
Deductibles Expenses	€3.66 billion	€0.37 billion

The table below shows the percentage differences between my study and Remmerswaal and Boone's study.

Table 8.4.4: Percent differences between Remmerswaal and this thesis

Remmerswaal		**No co-payments**	**Mandatory deductible €285**
	Thesis	**Abolition**	**Reduction €165**
Change total health insurance act expenditure	Nominal premium and income dependent contribution minus deductible expenses	-55.70%	-74.55%
Change Revenue Own Payments	Deductibles Expenses	-13.14%	73.83%

Interpretation of the comparison

The comparison between the results of my study and those of Remmerswaal and Boone (2020) offers some important insights. First, eliminating the deductible in both studies leads to a significant increase in health care spending. However, the projected increase in my study, which averages €4.83 billion per year, is significantly larger than Remmerswaal and Boone's forecast for 2022, which comes out to €2.14 billion. This difference can be attributed to the longer time horizon in my study, in which the accumulation of costs over several decades has a greater impact.

In addition, both studies predict a substantial decrease in deductible revenues when deductibles are abolished. The results are relatively consistent across studies, indicating the robustness of these findings. However, it is noteworthy that the predicted decrease in my study is larger in percentage terms (-55.70%) compared to the decrease in Remmerswaal and Boone's study (-13.14%).

The differences in the magnitude of the effects can partly be attributed to the different methodological approaches. Whereas my study uses linear regression and price elasticities based on data from 2011-2021, Remmerswaal and Boone apply a Bayesian mixture model to data from 2008-2013. Moreover, my research covers a broader spectrum of the population, including groups with high healthcare costs, which may explain the higher estimates of healthcare costs.

Finally, the comparison between these studies highlights that while the direction of effects is consistent, their magnitude can vary depending on the methodology chosen. This highlights the importance of using different models and techniques to get a full picture of the potential impact of changes in deductibles.

8.4.2 Conversions and comparisons Klein et al. (2024)

The study by Klein et al. (2024) focuses on the effects of different policy options related to patient costs, such as deductibles and co-payments, within the Dutch health insurance system. By using simulated scenarios, the authors examined how these policy options affect health care expenditures, out-of-pocket payments by patients, and health care premiums.

The results of Klein et al. are presented in a table that provides an overview of the predicted effects per person on a monthly basis for different policy options on three key financial indicators: health care expenditures, out-of-pocket payments, and health care premiums.

Table 8.4.5: Overall effects of counterfactual policies (Klein et al., 2024)

Policy Option	**Add. Spending (€)**	**Out-of-Pocket (€)**	**Premium (€)**
No cost sharing	232.13	0	232.13
€150 deductible	228.29	11.82	216.47
€350 deductible (status quo)	204.5	19.26	185.25
€500 deductible	172.92	14.52	158.4
Two-year €700 deductible	178.41	12.1	166.32
Donut hole from €350 to €700	209.04	14	195.04
75% coinsurance with €350 maximum	214.07	22.49	191.58
Co-payment €30	225.49	15.62	209.87
Co-payment €50	217.49	23.97	193.52
€350 deductible with monthly €150 cap	212.24	21.5	190.74

In order to make an accurate comparison between the results of this thesis and those of Klein et al, the similarities in scenarios and variables were identified. The following scenarios and effects show similarities, as shown in table 8.4.6.:

Table 8.4.6: Corresponding scenarios and variables between Klein et al. (2024) and thesis

	Klein et al	**Thesis**
Scenario	€350 deductible (status quo)	Base case
	No cost sharing	Abolition
	€150 deductible	Reduction €165
	Co-payment €50	Spread
	€350 deductible with monthly €150 cap	Spread
Variables	Add. Spending (€)	Nominal premium and income dependent contribution
	Out-of-Pocket (€)	Deductibles expenses

The Klein et al. results were then converted to allow for comparison with this thesis. It is important to note that this conversion does not reflect the exact results of Klein et al. but is intended to make the results comparable to the annual estimates in this thesis. Because the Klein et al. results are monthly values, they were multiplied by 12 to arrive at annual values.

The results were then compared to the €350 deductible scenario, which serves as the status quo in the study and is considered the base case. This comparison is shown in table 8.4.7:

Table 8.4.7: Converted results of Klein et al. by year

Policy Option	**Add. Spending (€)**	**Out-of-Pocket (€)**
€350 deductible (status quo)	0	0
No cost sharing	-331.56	231.12
€150 deductible	-285.48	89.28
Co-payment €50	-155.88	-56.52
€350 deductible with monthly €150 cap	-92.88	-26.88

These results were then juxtaposed with the results of this thesis, which show the 2027 impacts per person. The comparison between Klein et al. and the thesis is shown below in table 8.4.8:

Table 8.4.8: Comparison of results between Klein et al. (2024) and thesis

		Klein et al	Thesis	Klein et al	Thesis
Klein et al	**Thesis**	**Add. Spending (€)**	**Nominal premium and income dependent contribution**	**Out-of-Pocket (€)**	**Deductibles expenses**
€350 deductible (status quo)	Base case	0	0.00	0	0.00
No cost sharing	Abolition	-331.56	-508.60	231.12	222.90
€150 deductible	Reduction €165	-285.48	-184.87	89.28	21.61
Co-payment €50	Spread	-155.88	-433.57	-56.52	163.13
€350 deductible with monthly €150 cap	Spread	-92.88	-433.57	-26.88	163.13

Finally, the values were compared by calculating the percentage difference from this thesis, which is shown in table 8.4.9:

Table 8.4.9: Percent difference between results of Klein et al. and thesis

Klein et al.		**Add. Spending (€)**	**Out-of-Pocket (€)**
	Thesis	**Nominal premium and income dependent contribution**	**Deductibles expenses**
€350 deductible (status quo)	Base case	-	-
No cost sharing	Abolition	-35%	4%
€150 deductible	Reduction €165	54%	313%
Co-payment €50	Spread	-64%	-135%
€350 deductible with monthly €150 cap	Spread	-79%	-116%

Interpretation of the Comparison

Overall, both the methodology and resulting data show that there are significant differences between the results of Klein et al. and those of my thesis, which can largely be attributed to the methodological approaches used. While the linear regression in this thesis identifies broader trends, Klein et al.'s dynamic structural model allows them to make more detailed and sophisticated predictions. These differences in methodological complexity and the variables included in the analyses explain the discrepancies in the results.

The results in the table above show that the direction of effects is similar in many scenarios, although the magnitude of the differences can vary considerably. A notable exception is the “Spread” scenario, where the results of the two studies contradict each other in terms of direction of effects on out-of-pocket costs and deductibles expenses.

Herein, the conclusion of the Klein et al. study emerges: the overall conclusion of Klein et al. is that policy options that introduce higher patient costs, such as an increased deductible, can be effective in reducing overall health care spending and health care premiums. This is because patients are less likely to use care when they have to pay more themselves. At the same time, it appears that such policies, such as spreading the deductible, do not necessarily increase the financial burden on patients, as out-of-pocket costs may decrease under certain scenarios.

This underscores the importance of using complex models to more accurately simulate healthcare behavior.

8.5 Rule of half: consumer surplus

When conducting an SCBA, the rule of half must be considered when calculating consumer surplus, especially when expressing impacts. This section details this rule and explains how it plays a role in evaluating social costs and benefits.

The change in healthcare usage due to a price decrease can be analyzed using concepts such as consumer surplus and willingness to pay. In welfare economics, these concepts are often used to quantify the social effects of price changes.

Willingness to pay refers to the maximum price an individual is willing to pay for a good or service, or to avoid a particular disadvantage (e.g., harm or nuisance). It is a measure of the value a consumer places on a good or service. (Eijgenraam et al., 2000)

Consumer surplus is the difference between what consumers are willing to pay for a good or service and what they actually pay. This surplus represents the welfare gain that consumers experience by purchasing the good or service at a lower price than their maximum willingness to pay. Consumer surplus can be calculated as the sum of the differences between the willingness to pay and the actual price for all units of the good or service purchased. (Centraal Planbureau et al., 2013)

When the price for healthcare services decreases, healthcare usage increases. This can be explained by consumers' willingness to pay, which increases as the price decreases. Willingness to pay indicates consumers' willingness to pay for different amounts of care. If the price decreases from a higher level (p0) to a lower level (p1), and demand increases from a lower quantity (q0) to a higher quantity (q1), consumer surplus increases. Here q1 represents the new quantity, q0 represents the old quantity, p0 represents the old price and p1 represents the new price, figure 8.5.1 shows this visually.

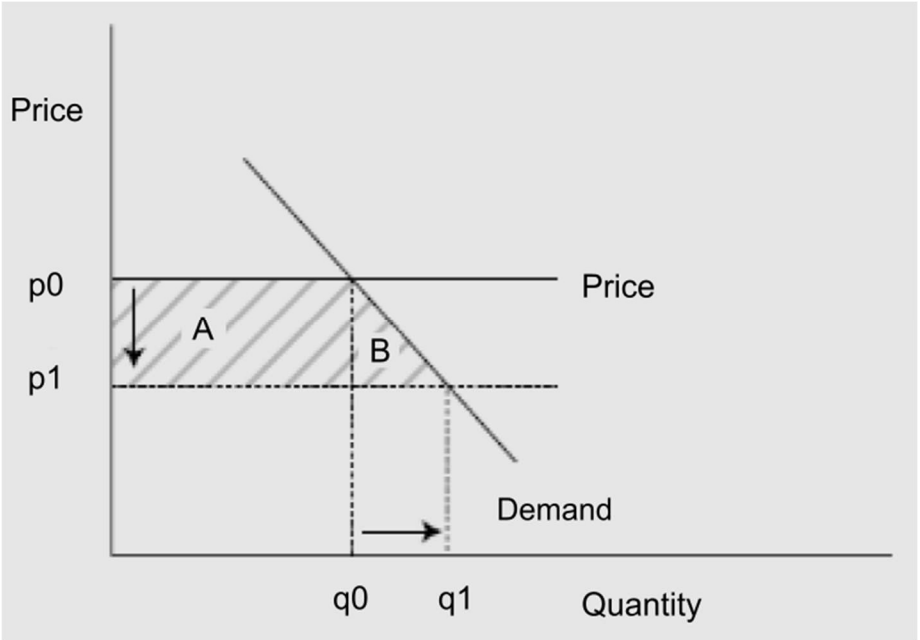

Figure 8.5.1: Rule of half, consumer surplus

The increase in consumer surplus due to a price decrease is represented graphically by the area under the demand curve between the old price and the new price. This increase consists of two components:

- Rectangle A Existing-consumer surplus

Rectangle A represents the cost savings for existing consumers, considering only the price change for the current quantity. To calculate rectangle A, only the price change for the existing quantity is considered, with no change in quantity. Δ existing-consumer surplus = q0 * (p0 - p1). In this study, rectangle A is defined as the decrease in deductible revenues, which represents the cost savings to the existing consumer, the existing-consumer surplus.

- Triangle B New-consumer surplus

Triangle B represents the welfare gain from the increase in demand due to the price decrease. For triangle B, both the change in price and the change in quantity are considered. Here, the rule of half is applied. This rule states that the change in new-consumer surplus is equal to the area of a triangle under the demand curve. This area can be calculated using the following formula: Δ new-consumer surplus = 0.5 * (q1 - q0) * (p0 - p1). In this study, triangle B is defined as the increase in healthcare usage by new consumers, the new-consumer surplus.

8.6 Overview total and average results

Table 8.6.1: Total results of SCBA

Total					
		Abolition	**Reduction €50**	**Reduction €165**	**Spread**
Accessibility to healthcare	Benefits	1.61E+11	1.17E+11	1.62E+10	1.16E+11
Nominal premium and income dependent contribution	Costs	-3.74E+11	-3.03E+11	-1.38E+11	-3.19E+11
Health benefits	Benefits	9.92E+09	8.63E+09	5.67E+09	9.62E+09
Total benefits		1.71E+11	1.26E+11	2.18E+10	1.25E+11
Total costs		-3.74E+11	-3.03E+11	-1.38E+11	-3.19E+11
Net Present Value	NPV	-2.04E+11	-1.77E+11	-1.16E+11	-1.94E+11
	NPV pp	-12688.98	-11041.06	-7250.85	-12101.32
Benefits Cost Ratio	BCR	0.46	0.41	0.16	0.39

Table 8.6.2: Average results of SCBA

Average					
		Abolition	**Reduction €50**	**Reduction €165**	**Spread**
Accessibility to healthcare	Benefits	3.66E+09	2.66E+09	3.67E+08	2.63E+09
Nominal premium and income dependent contribution	Costs	-8.51E+09	-6.88E+09	-3.14E+09	-7.26E+09
Health benefits	Benefits	2.25E+08	1.96E+08	1.29E+08	2.19E+08
Total benefits		3.88E+09	2.85E+09	4.96E+08	2.85E+09
Total costs		-8.51E+09	-6.88E+09	-3.14E+09	-7.26E+09
Net Present Value	NPV	-4.63E+09	-4.02E+09	-2.64E+09	-4.41E+09
	NPV pp	-288.39	-250.93	-164.79	-275.03

8.7 List of abbreviations

Abbreviation	English term	Dutch term
ACM	Consumers and Markets Authority	Autoriteit Consument & Markt
BCR	Benefit-Cost Ratio	
CoSEM	Complex Systems Engineering and Management	
IAB	Income-Dependent Contribution	Inkomensafhankelijke Bijdrage
IGJ	Healthcare Inspectorate	Inspectie Gezondheidszorg en Jeugd
NPV	Net Present Value	Netto Contante Waarde
NZa	Dutch Healthcare Authority	Nederlandse Zorgautoriteit
QALY	Quality-Adjusted Life Years	
Zvw	Health Insurance Act	Zorgverzekeringswet

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