FUNDAÇÃO GETULIO VARGAS
ESCOLA BRASILEIRA DE ADMINISTRAÇÃO PÚBLICA E DE EMPRESAS
MESTRADO EM GESTÃO EMPRESARIAL

Understanding Customer Preferences in Healthcare: A Conjoint Analysis of Private German Health Care Add-Ons

Dissertação apresentada à Escola Brasileira de Administração Pública e de Empresas para obtenção do grau de Mestre

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Rio de Janeiro – May 2024

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Understanding Customer Preferences in Healthcare: A Conjoint Analysis of Private German Health Care Add-Ons

Master's thesis presented to Master in Management program, Escola Brasileira de Administração Pública, Fundação Getulio Vargas, as a requirement for obtaining the title of Master in Management.

Advisor: Professor Fabio Caldieraro

Rio de Janeiro

2024

PREFACE

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Dados Internacionais de Catalogação na Publicação (CIP)
Ficha catalográfica elaborada pelo Sistema de Bibliotecas/FGV

Ashtiani, Dariosh Andrea Abidi

Understanding customer preferences in healthcare: A conjoint analysis of private German health care add-nos / Dariosh Andrea Abidi Ashtiani. – 2024.

69 f.

Dissertação (mestrado) - Escola Brasileira de Administração Pública e de Empresas, Centro de Formação Acadêmica e Pesquisa.

Orientador: Fabio Caldieraro.
Inclui bibliografia.

1. Administração dos serviços de saúde. 2. Saude - Planejamento. 3. Setor privado. 4. Serviço ao cliente - Avaliação. I. Caldieraro, Fabio. II. Escola Brasileira de Administração Pública e de Empresas. Centro de Formação Acadêmica e Pesquisa. III. Título.

CDD – 338.473621

Elaborada por Marcelle Costal de Castro dos Santos - CRB-7-RJ-007517/O

FUNDAÇÃO GETULIO VARGAS – ESCOLA BRASILEIRA DE ADMINISTRAÇÃO PÚBLICA E DE EMPRESAS
MESTRADO EM GESTÃO EMPRESARIAL

ANDREA DARIOSH ABIDI PALOMAR

"UNDERSTANDING CUSTOMER PREFERENCES IN HEALTHCARE: A CONJOINT ANALYSIS OF PRIVATE GERMAN HEALTH CARE ADD-ONS".

DISSERTAÇÃO APRESENTADA AO CURSO DE MESTRADO EM GESTÃO EMPRESARIAL PARA OBTENÇÃO DO GRAU DE MESTRE EM ADMINISTRAÇÃO.

DATA DA DEFESA: 03/07/2024

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ACKNOWLEDGEMENT

This research project at FGV EBAPE in Rio de Janeiro was the last step to graduate from the collaborative Double Degree Program of Católica Lisbon School of Business and Economics and Fundação Getulio Vargas - Escola Brasileira de Administração Pública e de Empresas. The dissertation marks an important step in my life and academic career. It brings my Master´s journey to an end and lays the foundation for my future career path.

First and foremost, I would like to thank my thesis supervisor Fabio Caldieraro, who holds the position as an Associate Professor of Marketing at FGV in Rio de Janeiro. His support, guidance, and insights have been invaluable for the completion of this research. I would like to thank Mr. Caldieraro for his open-minded and helpful manner. His calm and professional nature have supported me in this big project. I have grown a lot through the support and the research. I was able to expand my knowledge and skills.

Second, I extend my heartfelt thanks to all the respondents of my survey; without your invaluable data, this research would not have been possible. I also want to express my gratitude to my colleagues for their significant contributions and enrichment of my knowledge in the field of insurance.

Thirdly, I want to thank my friends and family for their constant support and inspiration. Without them, this journey would not have been possible.

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Abstract

Title: Understanding Customer Preferences in Healthcare: A Conjoint Analysis of Private German Health Care Add-Ons

Author: Dariosh Andrea Abidi Ashtiani

Purpose – The insurance market is highly competitive, with insurers developing into a reliable partner for customers. Individualized and group-specific service catalogs are designed for this purpose. This work examines which add-ons are beneficial for which customer group.

Design/Methodology – The study uses literature reviews and current trends to identify relevant add-ons for customer groups. A survey collects customer preference data to assign relative benefits of the add-ons to specific customer groups by using conjoint analysis and k-means clustering.

Findings – The study shows that all selected add-ons do maximize benefits for some of the customer groups. However, this differs from one customer group to another and there is no single preferred add-on for all groups.

Research limitations – The main limitation of this research is that conjoint analysis results cannot directly translate into consumer behavior. Additionally, survey data collection lacks precision, as add-ons and complex health insurance products cannot be detailed sufficiently.

Practical implications – Health insurance companies can use this analysis to address customer groups in a more targeted manner.

Social implications – Insurance companies can use the results to help target groups lead healthier lives with selected add-ons.

Originality – To my knowledge, it is the only study that is focused on innovative add-ons in health care plans.

Keywords: Health care plans, Customer preferences, Conjoint Analysis

Paper category: Master's thesis/ Research paper

Resumo

Título: Compreender as preferências dos clientes nos cuidados de saúde: Uma análise conjunta dos suplementos de cuidados de saúde privados alemães

Autor: Dariosh Andrea Abidi Ashtiani

Objetivo - Examinar quais add-ons são benéficos para cada grupo de clientes no competitivo mercado de seguros, criando catálogos de serviços personalizados.

Conceção/Metodologia - Revisões da literatura e tendências atuais identificam add-ons relevantes. Um inquérito recolhe dados sobre preferências dos clientes, usando análise conjunta e k-means clustering para atribuir benefícios relativos a grupos específicos.

Conclusões - As extensões selecionadas maximizam os benefícios para alguns grupos de clientes, mas variam entre grupos, sem um suplemento preferido universal.

Limitações da investigação - Resultados da análise conjunta não se traduzem diretamente no comportamento do consumidor. A recolha de dados do inquérito é imprecisa, pois suplementos e produtos complexos de seguros de saúde não são suficientemente detalhados.

Implicações práticas - As seguradoras podem usar esta análise para se direcionarem mais eficazmente a grupos de clientes.

Implicações sociais - Resultados podem ajudar os grupos-alvo a terem uma vida mais saudável com os suplementos selecionados.

Originalidade - Este é o único estudo focado em suplementos inovadores em planos de saúde.

Palavras-chave: Planos de saúde, Preferências dos clientes, Conjoint Analysis

Categoria do artigo: Dissertação de mestrado/trabalho de investigação

1.0 Introduction

Health insurance is one of the most important insurances in a person's life. Whether you fall ill during your working years, as a child or in retirement, medical care is essential in order to lead a healthy life worth living. However, medical care is expensive and can jeopardize the financial security of people who do not have or have not been able to build up reserves. Health insurance provides cover for cases in which vital treatments and medication are so expensive that no person with a normal income can afford them. It is therefore not surprising that the federal government has made health insurance compulsory since 2009 (Dbb, 2024). It is an essential part of social security and the cornerstone of a welfare state model. The German health insurance system is therefore unique in the world, as it consists of a dual system. In addition to statutory health insurance, it is also possible for certain population groups to take out private insurance. As of June 2023, 87.3% are covered by statutory health insurance and 10.3% by private health insurance (Vdek, 2024). In addition, there are 29.1 million people who are covered by statutory health insurance but have an additional private insurance (PKV, 2024). Statutory health insurance benefits are 95% identical, which is why private health insurance in particular requires significant additional benefits that are of great importance to the insured person (Krankenkassen DE, 2024). In a survey of private health insurers, the majority still see supplementary health products as a growth area (Deloitte, 2022). This is where this paper comes in. A conjoint analysis is used to measure the preferences of so-called add-ons to the basic tariff. The prime rate is kept uniform and is based on average values. This ensures an exclusive preference analysis of the add-ons only. The add-ons are selected based on representative interviews. The results are of significant benefit to private health insurers as they provide an insight into customer preferences. The trend in health insurance shows that insurers want to position themselves as a reliable and health-promoting partner for customers and not as a pure cost reimburser (Schilling, Pavlova & Karaman, 2023). This allows insurers to better assess their additional services and adapt them to the target group. Preferences are clustered according to target group, with insurers primarily interested in young and healthy customers. The conceptual structure of this study was strongly based on the report by Bridges et al. (2011). This paper contains a kind of checklist that was specially designed for conjoint analyses in the health care sector. Based on a precise research question, attributes and their level were chosen as the criterion to be analyzed. This is followed by the experimental design, which was selected as a survey. Based on this data, a statistical analysis was carried out, which includes the

preference measurement in the form of a conjoint analysis and a cluster analysis. The paper ends with a summary of the results and the implications derived from them.

1.1 Relevance

Health insurance is essential for private individuals, as we all fall ill once or several times in our lives. The older we get, the more susceptible we are to illness and the higher our healthcare costs become. Private health insurance grew in 2023. The total number of insurance policies rose by more than 600,000 to 37.8 million. This means that almost every second German citizen is privately insured. The number of supplementary insurance policies rose by 2.2 percent to a total of 29.1 million. The trend is therefore unbroken: more and more people want to use private provision to supplement the benefits of statutory health insurance. However, private health insurance is also an important player in the economy (PKV, 2024).

The market share of private health insurance in Germany was 10.6% in 2022. As part of the insurance industry, private health insurance is therefore an important part of the overall German economy. The 49 private health insurance companies in Germany generate a gross value added of €41.9 billion in Germany. If one measures the additional gross value added for every euro of value added, the private health care industry even outperforms highly innovative industries such as the automotive industry with 1.9. The private health care industry is also ahead of the automotive industry with 4.8 in the area of additional employment with every job created (5.0). 88,700 people in employment depend directly, indirectly and induced on the activities of the private health care sector as an economic player. Therefore, in macroeconomic terms, private health insurance an important factor (WifOR-Studie, 2023).

However, private health insurance also plays an important role within the health insurance sector. Through the coverage provided by private insurers, €41.2 billion flowed into the German healthcare system, and thus around €12.33 billion more into the healthcare system due to the additional turnover. The additional turnover represents the losses if the privately insured had statutory insurance. This is because private insurance companies generally pay higher fees to doctors, as they are billed according to the scale of fees for doctors (German: Gebührenordnung für Ärzte (GOÄ)) and without budgets. As a result, the outpatient medical care sector, for example, could generate €6.95 billion in additional revenue from privately insured patients in 2022 (WifOR-Studie, 2023). Private health insurance is also an important player for research and innovation in the field of medicine; the higher fees strengthen healthcare providers

financially and enable them to have better technical equipment, for example. In addition, more and more innovative medical treatments are covered. According to an analysis by the Scientific Institute of Private Health Insurance, more than every fourth prescription given to privately insured patients contains a new, patent-protected medication that has an additional benefit for the patient. This proportion is significantly lower for those with statutory health insurance. Private health insurance therefore makes an important contribution to the introduction of modern medicines. Private health insurance is becoming more attractive, as shown by the trend in recent years, with more people switching from statutory to private health insurance in 2022 than vice versa (PKV-Zahlenbericht, 2023). However, private health insurance is only as attractive as it meets the needs of the target customer group. According to a study by Deloitte, 16% of private health insurers were dissatisfied or rather dissatisfied with the 2021 financial year in the area of comprehensive health insurance. In the area of supplementary health insurance, the figure is as high as 27%. This is also the area with the strongest growth potential from the perspective of private health insurers. In the area of supplementary health insurance, 16% of insurers see very strong potential and 53% see strong potential. The expansion of supplementary health insurance and the acquisition of new customers is a decisive factor in overcoming the challenges ahead. This analysis supports which supplementary factors are of value to the insured and, above all, for which target group. Insurance companies could therefore better manage and expand their portfolio of offers in a more targeted manner to win new customers and increase their market share (Schilling et al., 2023).

1.2 Research Question and Objectives

A conjoint analysis, like any other analysis, requires a well and precisely defined research question that specifies what the work has to analyze (Bridges, 2003). The aim of this study is to obtain information about the preferences of supplementary benefits in German private health insurance. In this case, however, the additional services do not refer to existing services, but are intended to represent innovative services based in part on blockchain and digital transformation. The aim is to combine technological development with customer preferences. Old, standardized services or general services that are already included in the basic tariff are not taken into account. On the one hand, such services are mandatory and prescribed by the statutory health insurance anyway; on the other hand, such services and preferences have already been analyzed by Nayak et al. 2018, for example. The focus is on services that are not or only marginally used by insured people at this time. The analysis initially concentrated on German private insurance.

This is due to the dual system that prevails in Germany. This means that private health insurers are completely free to choose and offer benefits that are not included in the basic tariff. Private health insurers in Germany have a free choice of benefits and can therefore design their product freely and individually. However, the results can also be transferred to other countries and systems. Take private health insurance in Austria, for example, where there is no dual system, but customers are free to take out private supplementary insurance (Wendt, 2003). The research question addressed in this thesis is:

"What are the most important add-ons of a health care insurance and what is the relative value?"

In examining consumers' preferences for add-ons in healthcare plans, several secondary research questions arise. One key question is how demographic factors such as age, gender, and income influence these preferences. Another important area of inquiry is the extent to which health status, use of healthcare infrastructure, and sport activity affect consumers' choices for add-ons. Additionally, it is crucial to explore how consumers weigh the trade-offs between different attributes of add-ons when selecting a healthcare plan. Lastly, determining the overall utility or preference score for each add-on, and how these rankings vary across different consumer segments, is essential for designing targeted and effective healthcare plans.

2.0 Literature Review

2.1 History German Health Care

In the early Middle Ages, there were hardly any developments in terms of social security or safeguards for society. For a long time, the family and the family environment were regarded as the only safety net against unemployment, illness, or accidents. Only the church provided free asylums or homes for the population. In the late Middle Ages, guilds emerged to act as safety nets and to function as society. Industrialization added new problems and challenges. Many industrial workers were unable to insure themselves against illness, accidents, or unemployment. In Prussia, state poor relief was introduced for the first time during this period (Metz, 2008). In 1883, Otto von Bismarck introduced state health insurance for the first time, followed by accident insurance the following year and pension insurance. This is regarded as the basis for the German system, as it also introduced compulsory insurance (Metz, 2008). However, this insurance was only limited to blue-collar workers, which excluded other

occupational groups, prompting them to develop on a private-sector basis. From this point onwards, the dual sickness insurance system as it still exists today began. In particular, the groups of teachers, clergymen and civil servants were customers of private health insurance (Baier, 2012). The first privatized health insurance fund was the fund for civil servants of the Berlin police headquarters, introduced in 1848 (Metz, 2008).

2.2 Structure and Organization of Private Health Insurance

Private health insurance is organized and structured differently to its state counterpart. In Germany, there is the Association of Private Health Insurers. The central sponsors are private-sector companies that are united in this association. Its members include around 50 companies, 41 of which are ordinary members and seven of which are extraordinary members that operate health insurance together with another insurance sector. The 41 member companies include 18 insurance associations and 23 public limited companies (Mitglieder PKV, 2024). In addition, the external health insurance schemes for federal railway employees and postal workers should also be mentioned in the context of private health insurance. The private insurance agencies in Germany are also managed according to various principles. One example in this case is the equivalence principle. This principle can only be found in private insurance and not in state insurance. The principle here is that the ratio between risk and payment should be the same for all insured people. People who are classified as higher risk must pay higher contributions (Musil, 2003).

2.2.1 Private Health Insurance Benefits

German state health insurance has a catalog of benefits with a large number of different health services for the insured. The (compulsory) benefits are anchored in the Social Security Code SGB V and form the legal basis. Within the framework of statutory health insurance, the benefits are prescribed and cannot vary; every citizen is entitled to health-promoting measures. For this reason, private health insurance companies have been obliged to offer a basic tariff since January 2009. This is a tariff that must be adapted to the benefits offered by state health insurance. Nevertheless, private health insurers can freely design their range of services individually according to the tariff. However, many benefits are identical for each tariff (e.g. free choice of doctor and hospital or high dental prosthesis benefits).

These types of private health insurance also differ in the scope of benefits:

1. Full private health insurance: With full private health insurance, all costs incurred are covered. Both inpatient and outpatient treatment costs are covered 100% with this type of insurance.

2. Supplementary private health insurance: With supplementary private health insurance, all costs incurred in addition to the state insurance are covered privately. Benefits in this area are mainly dental examinations or certain medical treatments (Pfeifer, 2010).

2.2.2 Financing Private Health Insurance

In contrast to state health insurance, the private health insurance sector is financed exclusively by the contributions of the insured people. There are no subsidies or other co-payments from the state. Another difference to German state health insurance is the fact that the contributions levied by the insurance agency are independent of income, but depend on many other factors, which will be described in the next chapter. In addition, the system of financing private health insurance in Germany is based on the capital cover method, and not on the pay-as-you-go method like state insurance. By forming old-age provisions, fluctuations and changing contributions are largely avoided. These old-age provisions are intended to prevent premiums from rising in old age. The basis of these provisions is the consideration that people who have taken out private insurance also incur rising costs and claim more benefits as they get older. To avoid having to increase premiums, the liquid funds of the old-age provision are used. (Busse, 2013) In contrast to state health insurance, private insurance in Germany is not financed according to the benefits-in-kind principle, but according to the cost reimbursement principle. The stakeholders in the cost reimbursement principle are, in turn, the insured people, the insurance companies and the healthcare providers. After a person covered by a private insurance relationship has made use of a service, this person must initially pay the costs of this service themselves. Afterwards, a part or all the costs can be reimbursed by the insurance company. The amount of the reimbursed contribution depends on the chosen tariff and the benefits included (Eichenhofer, 2017).

2.2.3 Private Insurance Premiums

The calculation of premiums by private insurance companies in Germany is complex and not very uniform. As already mentioned, the premiums are not dependent on gross income, but depend on the complex interplay of many different factors. This means that there can be no uniform premiums. The criteria entry age, occupational group, current state of health, gender and different tariffs play a decisive role in calculating the premium amount (Freiling et al., 2013).

2.2.4 Risk Selection

As private companies are free to accept or reject potential policyholders (except for the basic tariff), risk calculation and thus risk selection is common practice (Dörfler et al.,2015). This risk selection primarily includes the criteria of age, state of health, but also the financial situation of the policyholder (Freiling et al., 2013).

It is important for private health insurers to keep the costs of treatment and potential medical assistance services almost constant and low. In addition, to minimize the risk of default, the contributions should be paid by the insured people on a monthly basis without exception. This approach is similar to that of banks, which also assess the risk of an investment and carry out a screening before issuing a loan. Therefore, it is very unlikely that people with chronic illnesses or who have suffered heart attacks, for example, will be accepted into a private health insurance scheme (Kalenborn, Schmitten & Sommerreißer, 2016).

2.2.5 Switching Private Insurance Companies

In most cases, it is possible to switch from one private insurance provider to another without any problems, but with some disadvantages for the insured person. Firstly, when joining a new private insurance company, the advanced entry age must be considered, which is associated with higher premiums than with the previous insurance company. The general rule is; the higher the entry age, the higher the premium rate. In addition, most private insurance providers carry out new health checks when you switch. New illnesses or complaints that have arisen since joining the old insurance policy can also significantly increase the premium rate. Accumulated old-age provisions can also be lost when switching to another provider (Naegele et al., 2010).

2.3 Challenges for Private Health Care Insurances

Private health insurance companies are facing a number of challenges that could affect their long-term profitability and competitiveness. One significant challenge is the low interest rate environment, which is depressing the average return on investments. Specifically, the interest gains of private health insurance in Germany have fallen from 4.6% in 2005 to 2.66% in 2021. This trend was further reinforced by the European Central Bank's lowering of key interest rates (PKV Finanzen, 2024). As private health insurance companies operate on a funded basis and have to build up old-age provisions for future benefit claims, a lower interest rate puts a strain on their financial resources.

The legal requirements stipulate that a large part of the surpluses must be used for the benefit of the insured, which limits the companies' scope for maximizing profits. In 2019, around 86.8% of company surpluses went to policyholders (PKV Finanzen, 2024). An increase in interest profits alone is not enough to increase the profitability of private health insurance companies. An increase in customers and the associated investment capital is required in order to achieve a higher percentage profit for the health insurance companies.

Political regulations pose a further challenge as they restrict the scope of action of private health insurance companies. The uncertainty caused by the Covid-19 pandemic with regard to future benefit expenditure, particularly in connection with long-lasting health consequences such as long Covid or late mental health effects, is leading to additional burdens (Grote & Beyer, 2020). Overall, rising costs can be observed in the healthcare system (Nowossadeck, 2012).

Due to the dual health insurance system in Germany, there are political efforts towards gradual integration. The “Hamburg model” allows civil servants to choose statutory health insurance without financial loss, which could lead to an exodus from private health insurance. This could reduce the customer base and income of private health insurance companies. In order to cover the costs, premiums for existing policyholders could rise. Private health insurance must therefore adapt strategically to remain competitive and profitable (Neusius, Krauskopf & Nitzke, 2020).

Rising living costs could have a negative impact on new business in supplementary insurance, while regulatory requirements such as data protection regulations and BaFin requirements hinder the full development of (healthcare) services. These regulatory hurdles make it more difficult for health insurers to improve their service offering and provide innovative solutions (Reiners, 2021; Fink, Mayrhuber & Rocha-Akis, 2022).

Demographic change poses a further challenge, as healthcare costs are rising with an ageing population and the ratio of contributors to insured people is becoming less favorable. In addition, advances in medical technology mean that better care is coupled with steadily increasing life expectancy (Schwarzbach, 2015).

Overall, private health insurance companies must meet these challenges with flexibility, innovation, and a strong customer focus in order to remain successful in the long term. A holistic strategy is required that considers both financial stability and customer-oriented solutions.

2.4 Conjoint Analysis in Health Care

There is a bunch of literature that explores the trade-off between a product's attribute and its effect on choice. Conjoint analysis methods are particularly useful for quantifying preferences for nonmarket goods and services. In health care market choices are constrained by regulatory and institutional factors so that in this field a conjoint analysis is of great value (Ryan & Farrar, 2000). Therefore, it is not wonder that there has been a rapid increase of using conjoint analysis in health care studies (Bridges et al., 2008). The research reaches from diabetes treatment (Hauber et al., 2005), to weight-loss programs and asthma medications (King et al., 2007).

Nevertheless, the research in the field of health insurance has focused primarily on price elasticities (Pendzialek, Simic & Stock, 2016), customer characteristics and conditions for insurance switchers (Lako, Rosenau & Daw, 2011) or the willingness to pay for health insurance (Wright, Asfaw & van der Gaag, 2009).

The actual analyses of customer preferences in health care insurance have been investigated by several literature. The analyses are similar in terms of the attributes of choice and differ, however, in the insurance market investigated.

Nayak et al. (2018) examines what customers expect from the health insurance industry in India and what it is willing to offer. Various attributes are ranked as per their perceived importance. The attributes include type of purchase, coverage type or disease coverage. The research showed that respondents have a clear preference for wide coverage, including more number of members in the family in a single policy.

Other analyses by van den Berg et al. (2008) refer to the Dutch health insurance market and have a similar attribute selection. Attribute categories such as quality of contracted care, quality of providing customer services and premium were integrated into the conjoint analysis. The aim was to identify trade-offs between various aspects of health insurance product design. The analysis also differentiated between high and low risk individuals and integrated these into the analysis. The study showed that not only high-risk individuals, but also lower risk individuals are willing to pay more for their insurance product if it offers better coverage.

In general, studies in recent years have increasingly analyzed whether preferences differ according to age and health status. However, Schilling et al., (2023) found that preferences are homogeneous for most subgroups of the population. The conjoint analyses in the area of health care insurance analyze the attributes in the areas of premium, additional medical benefits and additional customer service. The results are also similar, with the additional medical benefit attribute being the most important for most of the population (Pendzialek et al., 2017).

3.0 Methodology

To ensure a comprehensive and meaningful analysis, qualitative research, data collection and data analysis are required. The seven individual steps of the analysis are shown in Figure 1. The first step was a comprehensive analysis of existing literature to gain a basic understanding of the topic and its necessity. The second block comprises the data collection. The selection of attributes as the core of the analysis is essential. The last part of this work then comprises the actual analysis of the data and the corresponding interpretation and implication.

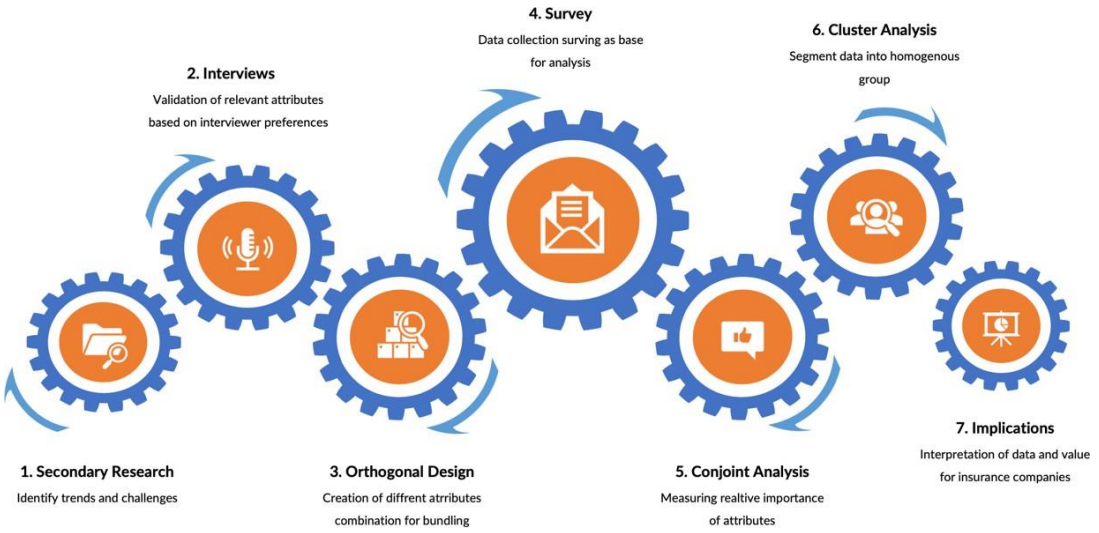

Figure 1: Methodology and Research Path

3.1 Secondary Research

This analysis is based on data and literature from third parties. These provide an initial direction and idea of which relevant aspects the analysis should cover. Existing analyses, in particular conjoint analyses (also in the area of health insurance), were used and expanded with the help of this work. Any information such as data, trends and challenges that could serve as a basis and relevance for this work were validated through data triangulation. The criteria for third-party data to be used are (1) credibility, (2) triangulation, and (3) confirmability. This methodology ensures a sound validity and reliability investigation. This initial examination of data also serves as a first indication of possible attributes to be included in the analysis.

3.2 Interviews

The core idea of this thesis is to investigate the preferences of potential customers of private health insurance but also of supplementary insurance. The services that are added as add-ons to the normal health insurance tariff are of essential importance. These attributes/features are the central core of the study and represent ways in which insurers can differentiate themselves from the competition. Interviews were conducted to not only work on the basis of secondary data and to also take the perspective of potential customers. These interviews were conducted as an informal and individual survey. The interviewees were asked about their personal wishes regarding the range of services offered by private health insurance companies without any influence or prior knowledge. These interviews were used to create an initial tendency for the importance of various service categories. To really cover all possible customer classes, the interviews were conducted with a large number of different people. The interviewees represent a broad section of the population and are represented by the following groups as potential customers of private health insurance.

3.2.1 Persona 1

The person we are looking for represents a young, highly qualified generation aged between 24 and 32. Their lifestyle is characterized by sportiness and health awareness, as they exercise regularly and pay attention to a balanced diet.

They invest a lot of time and energy in their work, which means that flexibility in health insurance benefits is of great importance to them. Digitalization plays an important role in their lives, and they expect technology to be used to improve access to healthcare services and make the process of medical care more efficient.

Overall, they are looking for health insurance that meets their needs for flexible coverage, a modern digital approach and high-quality healthcare services. The most mentioned add-ons were:

- Travel Insurance
- Telemedical care
- Digital customer service

3.2.2 Persona 2

The second group comprises highly qualified workers aged between 32 and 65 who are either employed full-time or self-employed. Many of them are married or have started families at this stage of their lives. For them, it is important that their health insurance offers benefits that meet the needs of their family.

This group attaches particular importance to old-age cover, as they are aware that provision for retirement plays an important role. They look for health insurance that not only covers their family's current health needs, but also offers long-term benefits, such as retirement and pension benefits.

Protection against unforeseen events and illnesses and the ability to provide for the future are crucial for this group. They expect their health insurance to offer them security and financial stability, both in the present and for the future. The most mentioned add-ons were:

- Family insurance
- Quick access to specialists
- Health programs and preventive measures

3.2.3 Persona 3

The third group comprises people aged 65 and older who are either approaching retirement or are already retired. For them, health insurance that meets their specific health needs in old age, including preventive check-ups and specialized care, is important.

Personal contact is very important for this group. They value individual support and a fixed contact person at their health insurance company. They are also looking for cover for future medical expenses and value benefits such as long-term care and support for chronic illnesses.

Overall, they expect their health insurance to provide comprehensive cover that gives them a sense of security and financial stability in retirement, while personal contact and individual care play a crucial role. The most mentioned add-ons were:

- Specialized care
- Medication management
- Long-term care
- Personal contact

3.3 Survey

The survey serves as the primary source of data and is therefore of great relevance to the results of the study. A survey with a good question selection, structure and test run enables accurate and relevant data collection (McClelland, 1994). To design a high-quality survey and ultimately obtain usable data, a well-considered design is required. In this case, an online survey was used as a method, which has several advantages over old-fashioned surveys (such as telephone). Firstly, a dynamic online survey increases the motivation of the participant to complete it (Schmidt, 1997). Furthermore, the frequency of errors in transcription and coding are minimized (Zhang, 2000). In this age, the online survey is of course the most popular tool, as a larger audience can be addressed cost-effectively and with little effort (Check & Schutt, 2012).

However, this audience is limited, as only people with Internet access can take part in the survey. Accordingly, the biggest problem of an online survey is biased samples and biased returns. The respondents need to be skilled enough and feel comfortable to use the online tool and answer the survey (Berge & Collins, 1996). As these conditions are not met in the predominantly older generation, older people were also explicitly addressed to obtain a balanced group of people.

In terms of content, there are a few requirements to consider when creating a survey. The survey consists of four parts which are visualized in Figure 2. The first part comprises the introduction, which contains the motivation and explanation of the attributes. This part is very important because an introduction to the topic increases the motivation of the respondents and encourages them to answer all conjoint questions meaningfully. Good research explains the attributes in advance to ensure a meaningful conjoint analysis (Bridges et al., 2011).

The second part consists of the conjoint questionnaire, which is designed to estimate the strength of respondents' preferences (Bridges et al., 2011). As already explained in chapter 3.4 the respondents were asked to evaluate 11 different product bundles. This number is also in line with the suggestions of Bridges et al., (2011), whereby 8-16 conjoint analyses tasks are optimal.

The third part comprises the sociodemographic data. This can be used to measure whether and how preferences differ for various characteristics such as age and gender. Furthermore, it is also intended to compare the characteristics of the sample in the survey against the relevant target group of the study (Bridges et al., 2011). For this purpose, statistical tests such as the chi-square test are undertaken in chapter 4.5. The health status of the respondent is also relevant for this study. This is because it can systematically influence preferences. It is also relevant to measure

how well respondents are familiar with healthcare and services (Bridges et al., 2011). For the sake of simplicity, a question was asked about how often people use healthcare infrastructure. This implicitly assumes that people who visit the doctor often are well acquainted with the services and also tend to have poorer health.

The survey ends with an acknowledgement and voluntary participation in the competition. To generate a greater willingness to participate, five Amazon vouchers were raffled off among the participants. All they had to do was enter their email address. The reason for this is that the reward must be higher than the effort required from the participants to generate a positive response. In this case, it took an estimated five minutes to complete the survey (Wang, Zheng & Meng, 2017). The survey was offered in both English and German to ensure understanding for the German target group.

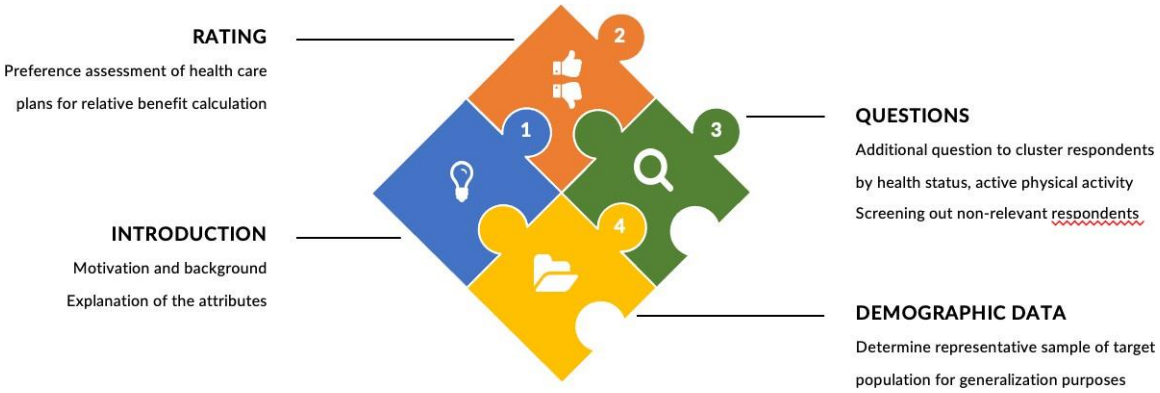

Figure 2: Survey Structure

As a general rule, the questions should be clear and simple. It is advisable to ask simple rather than complex questions and to leave out technical terms. The questions should be kept as short as possible to keep the survey under 5 minutes (Holbrook, Cho & Johnson, 2006). It should be avoided that the question leads the respondent to give a certain answer. When using multiple choice questions, care was taken to ensure that all category answers were mutually exclusive (Somekh & Lewin, 2011). The respondents where therefore offered more specific quantifiers in the response options by adding for example specific numbers how many physical activities are considered as "often" or not. Questions has not been worded negatively since they have been founded to take longer to process by respondents (Weemse et al., 2003). Based on studies by Saris and Gallhofer (2007), a neutral 5 position was deliberately added to the response options. This generates greater validity and lower random error variance. To utilize the initial motivation of the respondents, the complex questions were placed at the beginning and

demographic questions at the end (Lietz, 2010). Generally, closed ended questions with multiple choice answers were chosen, as the answers of respondents are limited, and this simplifies the survey (Roopa & Rani, 2012).

After creating the first survey draft, it was tested with 10 test subjects. Such a test run makes it possible to detect errors and possible ambiguities that are not comprehensible from the point of view of the creator (Taherdoost, 2018). The focus was on a clear understanding of the attributes in the explanation section. This also prevented any technical problems. The implementation on different end devices was tried out, as it is important that participants can complete the survey with smartphones, PCs, tablets, etc. (Malhotra, Nunan & Birks, 2007). In the explanatory section, it was pointed out that the respondents should only complete the survey once. This is important as otherwise the data from one person would be double weighted (Graham & Schuman, 1982) All data collection must be kept confidential, and additional trust was created by adding a contact method (Saunders, Lewis & Thornhill, 2015).

3.4 Orthogonal Design

Based on the experience gained from the interviews and the consideration of the latest trends, 7 attributes form the core of the analysis. The requirements for these add-ons will be highlighted in chapter 4.1. Based on these add-ons, different product types are to be developed. The standard tariff, which is available to every insured person like a base, serves as the basis. The add-ons are then added to this basic tariff, which distinguishes each product option from the others. Attributes are therefore bundled and made into a product that can be selected by the customer. As each product attribute has two characteristics (either present or absent), a large number of product alternatives are created. In detail, $128 = 2 * 2 * 2 * 2 * 2 * 2 * 2$ product alternatives would be available. Having all 128 possible combinations evaluated would be too extensive. As a result, the survey participants would be overwhelmed with the decision (Sebeery, 2018). Such an approach would also not be advisable in reality, as the complexity and costs of such a survey would increase significantly. To overcome this limitation, the orthogonal design calculates the minimum number of combinations that would represent all 128 possible combinations. To be able to carry out the conjoint analysis with a reduced number of possible combinations, an even distribution of the characteristics and their values is required. For this reason, only two values were selected for all characteristics in the study. The SPSS system then calculates a certain number of combinations to be evaluated in the survey. In this

analysis, 8 combinations would therefore be the minimum number of combinations to be evaluated. However, in order to make the analysis a little more precise, it is possible to add so-called holdout cases. These are three random additional possible combinations that enable a more precise analysis but do not necessarily have to be added. However, to make the analysis more precise, this option would be selected so that 11 different product alternatives would have to be evaluated in the survey.

3.5 Conjoint Analysis

The conjoint analysis is a decompositional method that estimates the parameters of a preference model on the basis of empirically collected overall utility judgments for a set of stimuli (e.g. alternative new product concepts) and in this way determines the relative utility contributions of individual stimulus characteristics (e.g. product features) to the overall utility (Wittink & Cattin, 1989). The starting point is a survey in which participants are asked to evaluate products (e.g. ice cream) or choose between them. The products differ in their attributes (e.g. variety, price, packaging). These factors are determined in advance by the researcher.

Three evaluation options are available. In the ranking method, respondents rank the stimuli according to their perceived benefit and assign them non-metric place numbers (Stallmeier, 1993). In the dominant, so-called profile method, which is close to reality, respondents are asked to evaluate complete stimulus profiles consisting of a combination of one characteristic of each relevant property (Backhaus et al., 2000). An alternative to estimating a preference model on the basis of ranking or rating data is the choice-based conjoint analysis (Louviere & Woodworth, 1983). Two products are presented in parallel and the respondent has to choose one of them. This variant is classified as the closest to real choice situations. However, there is no explicit evaluation of the alternatives not chosen, which leads to a comparatively lower information content of the data collected (Teichert, 2000a).

The advantage of rankings over ratings is the presumably higher reliability of ordinal ranking data compared to rating data. However, metric rating data provide a potentially higher information content and were therefore chosen for this study (Green & Srinivasan, 1978). Metric part-worth utility values for the individual stimulus characteristics are obtained from the available preference judgments using appropriate estimation methods (Green & Srinivasan,

1990). The preference model primarily used in conjoint analyses is the linear-additive, compensatory part-worth utility model, which assumes independence and discreteness of the characteristics considered and can be represented as follows (Baier, 1999)

$$y_{ij} = \sum_{m=1}^{M} \sum_{n=1}^{N_m} \beta_{imn} z_{(i)jmn}$$

$i = 1, \ldots, I$ Respondent

$j = 1, \ldots, J_{(i)}$ Stimuli to be evaluated by individual i

$m = 1, \ldots, M$ Characteristics; $n = 1, \ldots, N_m$ values of characteristics m;

y_{ij} : Preference value individual i for stimulus j (or stimulus to be evalauted at option j) β_{imn} : Partial utility value of the i – th individual for characteristic n of property m

$$z_{(i)\,jmn} = \begin{cases} 1 \text{ if stimulus j has the characteristic n of property m} \\ 0 \text{ otherwise} \end{cases}$$

The conjoint analysis tries to determine the partial utilities ("parthworths") β for all factor values absed upo the the ranked data. Furthermore, with these partworths it is possible to compute the metric total utilities y of all incentives and the relative importance of the single object attributes. Possibilitie to Individual Conjoint Analysis: For each person utility values are computed or Combined Conjoint Analysis: Only one value for each factor category. In both cases, if metric preference values were used, the partial utility values are estimated using the ordinary least squares (OLS) approach (Jain, Malhotra & Mahajan, 1979).

A regression equation is estimated where the independent variables are the object attributes, and the dependent variable is the preference of the interviewed person for the fictive product. According to the requirements of regression analysis, there must be more observations J_i for each individual than there are parameters β_{imn} to be estimated. Even if this technical requirement is met and estimation is therefore possible in principle, unstable parameter estimates are to be expected with a small database due to the small number of degrees of freedom (Wedel & Kistemaker, 1989). This limitation occurs almost regularly in individual conjoint analyses but is rarely questioned further when deriving marketing implications from the estimation results (Cattin, 1981).

3.6 Cluster Analysis

Cluster analysis is a term used to describe a family of statistical procedures designed to discover classifications within complex data sets. The goal is to cluster data into homogenous groups (Everitt, Landau & Leese, 2011). Therefore, the data within one cluster share more in common with each other than they do with the data of other clusters (Gore, 2000). Transferring this to data based on people respondents, people clustered in one group are more alike than the people that are cluster in a different group (Sorger, 2013). It is possible to do this using demographic data such as age, income, gender or origin. It is also conceivable to use other statistical data such as preferences (Gore, 2000).

There are several phases in conducting cluster analysis which are identical for different clustering methods: selection of distance measure for individual observations, selection of cluster algorithm, defining the distance between clusters, determining the number of clusters and validation of analysis (Everitt et al., 2001). There are different methods of clustering which yield to different cluster results. The most frequently used method is k-means clustering, which was also chosen in this work due to its simplicity. (Dubes & Jain, 1988). The k-means algorithm, proposed by J.B. MacQueen, is an unsupervised clustering method extensively used in data mining and pattern recognition. The algorithm aims to minimize cluster performance indices, such as square-error, by iteratively adjusting initial cluster centroids to achieve optimal k divisions. Initially, k sample points are chosen as centroids, and remaining data points are assigned to the nearest centroid based on a minimum distance criterion. This process repeats, recalculating centroids and reassigning points until the clusters stabilize. The k-means method is valued for its simplicity, efficiency, and speed. However, its performance is highly sensitive to the choice of initial centroids, often resulting in varied outcomes and a tendency to converge to local minima. This dependency can lead to suboptimal clustering when initial centroids are poorly selected (Li & Wu, 2012).

3.7 Sample Size

The sample size is a decisive factor for data collection through a survey. It depends on several factors such as the question format, the complexity of the choice tasks, the desired precision of the results, the degree of heterogeneity in the target population, the availability of respondents,

and the need to conduct subgroup analyses (Louviere, Hensher & Swait, 2000). Some previous Conjont analyses apply rules of thumb based on the number of attributes (Orme, 2006)

For this survey, based on Orme 2014, the following equation was used to generate the number of respondents:

$$\text{Number of respondents} = \frac{(M * C)}{(T * A)}$$

(1) M = multiplier, (2) C = largest number of levels across all features, (3) T = number of tasks or questions, and (4) A = number of alternatives or choices per question

An exogenous variable is M, which should be 750 for small studies like this one (Cattin & Wittink, 1982). The other variables are endogenous; they are determined by the conjoint analysis itself. All attributes have two different levels (C=2) and based on the orthogonal design there are 8 or 11 (three product alternatives were added to control for more precise analysis) - (A=11). Only one question is asked about consumer preferences (T=1).

$$\frac{(750 * 2)}{(1 * 11)} = 136{,}36 \approx 137$$

If you now insert the numbers and the equation, you get 137 minimum required answers.

Since a larger number of answers leads to a more accurate analysis (Foody, 2009). The target of 200 answers was set for this study. This is because the data preparation will remove unusable data. With a number of around 200, this is similar to the number of most conjoint analyses, which have mostly between 100 and 300 respondents in the field of health (Marshall et al., 2010).

4.0 Data Collection and Analysis

4.1 Add-ons

The conjoint analysis in this study focuses exclusively on the add-ons of a health insurance plan. The add-ons or benefits of health insurance plans can be divided into three categories. Firstly, we have the fundamentals, for these attributes are quite uniform across all customer categories, given that affordability, price transparency and quick access to healthcare services

are generally desired by all individuals. Thus, features such as price, deductible, waiting time to see a doctor, termination policies, payment mode, and network coverage will remain constant for all plan options, reflecting standard features applicable to each plan. These attributes have already been analyzed in abundance and explained in chapter 2.9 in the form of a literature review. Especially as the attributes have a more complicated level structure. It would be conceivable to examine a low, medium and high contribution rate, for example. With each additional level, the combination of how many different product bundles can be created increases and therefore also the complexity. To avoid this, the analysis focuses only on add-ons that can be represented in two levels. This results in only the options that the insurance company offers this service/method or not. This methodology ensures that the assessment focuses exclusively on the specific add-ons' impacts and their perceived significance to consumers when opting for a healthcare insurance plan. By maintaining consistency in the core attributes across all plans, the analysis can offer an impartial and accurate evaluation of the add-ons' appeal and their potential value to consumers.

The add-ons that serve as the core of the analysis and have emerged from the interviews and the latest trends can be divided into two different categories (Appendix 7.1). Firstly, the attributes that respond to changing customer preferences and needs. These are customer-specific and change the service catalog itself. These include additional services such as psychological support or travel insurance. On the other hand, we have attributes that are more likely to change the way insurance works. Such attributes are strongly associated with digital transformation and are aimed more at a more effective way of working within the insurance company. The features to be analyzed in the study must be relevant for the purchase decision and have a direct influence on the overall benefit of the product.

Furthermore, the features must be influenceable and realizable by the company. This also means that the addition of an add-on does not change the basic plan. A standardized basis is required, otherwise no objective comparison can be made. In order for this criterion to be met, add-ons such as HSA and decentralized patient records were adapted accordingly to create realistic product alternatives.

Table 1: Selected Add-ons

Add-on	Level 1	Level 2
Fitness Tracker	Yes	No
Psychologischer Support	Yes	No
Smart Contracts	Yes	No
Health Saving Accounts	Yes	No
Travel Insurance	Yes	No
Online Medical Record	Yes	No
Telemedicine	Yes	No

4.1.1 Fitness Trackers

Fitness trackers are wearable devices that collect human physiological data, offering functionalities like tracking steps, monitoring physical activity, and measuring stress levels. Fitness trackers engage users in a reflexive interaction, collecting data and providing feedback (Becker et al., 2017). Continuous use depends on users' trade-off decisions between benefits and adverse properties. Motives for use include gamified tools and increased control over one's life (Sjöklint, Constantiou & Trier, 2015). Privacy concerns are a prominent cost factor, although users may perceive fitness trackers as less intrusive than other devices (Motti & Caine, 2015). Other cost factors are less explored (Coorevits & Coenen, 2016). These devices have become increasingly popular among individuals seeking to lead healthier lifestyles, offering real-time feedback and motivation to stay active and make informed decisions about their well-being. In Germany, around 6.6 million people are using wearables in 2023 (Statista 2023).

Beyond personal use, fitness trackers have also garnered interest from healthcare insurance providers due to their potential to mitigate healthcare costs. By encouraging policyholders to utilize fitness trackers and share their data, insurance companies can gain valuable insights into individuals' activity levels and overall health status. This data can inform the development of personalized wellness programs and interventions aimed at preventing or managing chronic conditions such as obesity, diabetes, and heart disease. In addition, the transmitted data can be used to calculate premiums and risks. In this case, incentives should be created to achieve pre-

defined health targets in order to achieve a reduction in premiums. The targets could be set moderately and based on the guidelines of a World Health Organization, for example.

4.1.2 Psychological Support

Psychological support on a daily basis is crucial for maintaining mental well-being and managing stressors effectively. Events such as the Covid pandemic and the resulting increase in psychological stress highlight the importance of mental health (Skoda et al.,2021). This support can come in various forms, including access to trained professionals such as therapists or counselors who provide guidance and coping strategies (Hamdoun et al., 2023). However, with the advancement of technology, there is a growing opportunity to incorporate AI-based chatbots into mental health support services. These chatbots can offer immediate assistance and guidance to individuals experiencing emotional distress or seeking advice on managing their mental health (Boucher et al., 2021).

Insurance companies can play a significant role in offering AI-based chatbot services for mental health support to their customers. By integrating these services into their existing platforms or mobile apps, insurance companies can provide an additional layer of support to policyholders at no extra cost. This proactive approach to mental health care not only enhances customer satisfaction but also demonstrates a commitment to promoting overall well-being. Furthermore, access to psychological counseling and support could be offered as a basic benefit. This would allow the insurance company to provide psychological counselling not only in the event of illness, but also to recognize preventive and helpful support in everyday life.

4.1.3 Telemedicine

Telemedicine is the opportunity to bring digital transformation to the customer experience and integrate it into the healthcare system. It enables patients to receive some of their healthcare remotely. This approach makes it possible to consult with healthcare providers, receive diagnoses, and obtain treatment without the need for in-person visits to clinics or hospitals. Forms of communication include video conferencing, phone calls, text messaging, and secure online portals (Haleem et al., 2021).

Insurance companies can leverage telemedicine to attract new customers by offering it as a convenient and cost-effective healthcare option. Cooperation with telemedicine providers or

the integration of a telemedicine platform into the insurance company's own platforms is necessary to attract new technology-savvy customers. This expands the range of services offered by the insurance company. Telemedicine allows insurers to expand their customer base beyond traditional demographics, attracting individuals who value convenience and efficiency in their healthcare experience (Weinstein et al., 2014). Aside from a wider range of customers, it is possible for insurers to save costs. On the one hand, more expensive medical visits can be replaced by virtual and, above all, more cost-effective medical consultations. On the other hand, there is the possibility of reducing later healthcare costs through earlier intervention (Hwei, & Octavius, 2021).

4.1.4 Smart Contracts

A smart contract is a program driven by events and states, capable of operating on a blockchain platform to manage assets stored within the blockchain (Luu et al.,2016)

Moreover, blockchain's scripting capabilities can be leveraged to generate cryptographic contracts that automatically fulfill predetermined agreement obligations through the utilization of self-executing scripting languages (Szabo, 1997) The blockchain in the form of a smart contract can then trigger service processing when certain conditions are met without the need for human action (Getteschi et al., 2018b).

This technical innovation can revolutionize the insurance industry and generate greater efficiency by automating and streamlining various aspects of claims processing. The automation of the validation, verification and settlement of claims reduces manual intervention. One of the key benefits of using smart contracts in insurance claims processing is increased transparency and trust. Since smart contracts operate on blockchain technology, all transactional data and contract terms are recorded on a decentralized ledger, providing an immutable and transparent record of the claims process. This transparency helps to mitigate fraud and ensures that claims are processed fairly and accurately, enhancing trust between insurers and policyholders (Novikov et al., 2018). For the customer, it is important that the use of smart contracts can reduce the processing time of claims, with the side effect of reduced operational costs for the insurance company (Gatteschi et al., 2018b). The reduced costs result from the reduced resources of employees (Kar & Navin, 2021).

4.1.5 Travel Insurance

In the course of globalization, people are also experiencing unprecedented mobility. This is also reflected in society's travel activities. Travel insurance is a product that can also be taken out by any customer. The changing and dynamic needs of customers can be met by integrated travel insurance. Especially for young individuals, flexible and comprehensive travel insurance could be of great importance. This would support an international lifestyle and protect against any risks such as unforeseen emergencies like accidents, illnesses, or travel disruptions. This expansion of the benefits catalog could be linked to blockchain technology. For example, information about flight cancellations could be transferred to smart contracts so that they can automatically initiate the claims process. The specific elaboration of the service catalog must be examined individually, as foreign insurance increases complexity.

4.1.6 Online Medical Record

A decentralized patient record system leveraging blockchain technology offers a groundbreaking solution to the longstanding challenges of healthcare data management. Traditional patient records are often fragmented across multiple healthcare providers and systems, leading to inefficiencies, inaccuracies, and privacy concerns. By harnessing the decentralized and immutable nature of blockchain technology, a patient's medical records can be securely stored and managed in a single, tamper-proof digital ledger accessible to authorized stakeholders (Reen, Mohandas & Venkatesan, 2019). The decentralized nature of blockchain ensures that patient records are not stored in a single, vulnerable location susceptible to hacking or data breaches. Instead, data is distributed across multiple nodes in the network, making it virtually impossible for unauthorized parties to alter or manipulate records without detection.

By using a decentralized medical record, the medical history, including diagnoses, treatments, medications, and test results, is recorded as a series of encrypted transactions on the blockchain. These records are linked to the patient's unique identifier, ensuring data integrity and authenticity. The healthcare facilities can then view medical records in real time and also update or edit them. This enables seamless coordination and reduces the risk of incorrect treatment due to outdated knowledge. Since the establishment of a decentralized patient file also requires the coordination of the doctors' network, the technology for the examination would have to be changed. One conceivable option would be a portal created by the insurance company in which the patient can control their file and access authorization themselves. Data exchange with

healthcare providers would then have to be standardized. Furthermore, legal requirements and data protection regulations limit the use of such technology (Bincoletto, 2020). For the first time, this limitation is not applied in this study; exact details and consequences are described in chapter 5.1.

4.1.7 Health Saving Accounts

Health Saving Accounts (HSA) are financial accounts that individuals can use to save for qualified medical expenses on a tax-advantaged basis. In the United States, HSA are typically paired with high-deductible health insurance plans. Contributions to HSA are made with pre-tax dollars, reducing individuals' taxable income and allowing them to save money for healthcare expenses while enjoying tax benefits. Funds in HSA can be used to pay for various medical expenses, including deductibles, copayments, and coinsurance, as well as certain medical services and prescription drugs (Lo Sasso, Shah & Frogner, 2010).

Despite the fact that a conjoint analysis should also analyze attributes that are currently not feasible (due to technical limitations, for example), modifications are necessary to ensure relevance (Bridges et al., 2014). In the course of this analysis, the methodology must be modified in such a way that the core idea is retained but the design power lies with the insurance provider. As pre-tax savings are part of government regulations and cannot be modified by insurance companies, an alternative approach would be to offer post-tax savings accounts for healthcare expenses. In this modified version, insurance companies could finance a portion of the amount the customer saves in their healthcare savings account, with the condition that the customer agrees to a higher deductible until a specific amount is reached. The funds in the savings accounts are only useable for medical treatment and healthcare-related expenses. This modified approach could potentially increase the incentive for individuals to stay healthy and utilize healthcare services more judiciously.

The add-ons can basically be divided into three categories based on their mode of action. Firstly, we have the attributes that can cause a cost reduction on the part of the customer. These include the fitness tracker and HSA add-ons. These are aimed at the customer's initiative to live healthier and thereby reduce premium rates. As a result, the cost of benefits for the insurance company could also fall. Add-ons such as smart contracts and digitalized medical records are aimed at making insurance more efficient. For the first time (we abstract that the insurance company passes on the cost savings to the customer), the customer will not have any cost

advantages, but the increased efficiency could also have a positive effect on customer satisfaction. The other add-ons such as telemedicine, psychological support and travel insurance represent an additional service for the customer. The customer would receive additional benefits under the same contract conditions. Of course, the policyholder might perceive this as a cost reduction, as more benefits are offered for the same premium. However, in fact and in absolute terms, the customer does not pay more or less.

4.2 Data Preparation

The primary data collected from the survey is the basis for the conjoint and cluster analysis (Appendix 7.4). This data must be carefully examined in order to obtain valid data strings (Malhotra, Nunan & Birks, 2017).

First, the raw data is transferred from the Qualtrics survey tool to Excel. There, the first data cleaning takes place, whereby irrelevant columns such as "Time" or "Location Longitude" are removed from the data set. This makes the data set clearer and more convenient for further processing. In this step, unusable data strings were also removed. Basically, all responses that did not complete all the questions in the survey were removed. This applied to both the demographic questions and the evaluation of the insurance plans. In addition, possible duplicate responses were deleted using the IP address so that no data strings counted twice. However, the majority of the removed data strings concerned data that did not belong to the potential target group. This was determined on the basis of the question about German health insurance. In order to better represent nominally scaled data (job, gender, health status or sport), these were presented numerically. Therefore, each characteristic (answer option in the survey) was assigned a number. For example, the number "1" was assigned to men and the number "0" to women. This number has no mathematical meaning and cannot be interpreted in the descriptive statistics, for example. This adjusted data set was then inserted into SPSS in order to carry out all statistical evaluations, such as the actual conjoint and cluster analysis.

4.3 Descriptive Statistics

A total of 295 responses were collected in the survey. After cleaning the data set according to previously defined criteria, 224 complete and relevant data strings remained. 71 data strings were removed, 46 of them due to missing German health insurance and the rest due to incomplete answers.

One striking result of the survey is the very low average rating of 1.51 for Plan 3, which does not include any add-ons and was therefore rated the lowest by consumers. Plan 9 was rated similarly poorly with an average score of 2.35, as it only includes two add-ons. In contrast, plan 7 received the best rating with an average score of 7.01, followed by plan 6 with 6.05. Most plans did not receive either the lowest extreme (0) or the highest (10) of the rating scale.

The age distribution of survey participants ranged from 18 to 81 years, with an average age of 46.46 years. The age groups are well represented: 31.7% of participants are between 18 and 35 years old, 34.8% between 36 and 55 years old and 33.5% between 56 and 81 years old.

The nominally scaled data was analyzed using frequency distributions. There is a balanced gender distribution with 53.6% men and 46.4% women. In terms of professional situation, 47.8% of respondents are employed, 20.1% are self-employed and 13.4% are retired. The income distribution shows that the majority of participants have an income of between 20,000 and 65,000 euros (33.5%) or between 65,000 and 100,000 euros (32.1%).

The majority of respondents (53.1%) are covered by statutory insurance and also have private supplementary insurance, while 8% have purely private insurance. Sporting activity shows that 49.6% of participants do moderate sport and 28.6% do minimal sport. The use of healthcare facilities is balanced, with 37.5% of respondents using healthcare facilities regularly and 25.4% occasionally.

Table 2: Descriptive Statistics Health Care Plans and Age

	N	Minimum	Maximum	Mean	Std. Deviation
Plan1	224	1	10	5,12	2,156
Plan2	224	0	8	3,95	2,131
Plan3	224	0	10	1,51	2,213
Plan4	224	1	10	5,98	2,050
Plan5	224	1	10	4,38	2,100
Plan6	224	1	10	6,05	1,781
Plan7	224	1	10	7,01	1,956
Plan8	224	1	10	5,61	2,296
Plan9	224	0	7	2,35	1,666
Plan10	224	1	9	5,98	1,998
Plan11	224	1	9	4,15	2,173
Age	224	18	81	46,46	16,636
Valid N (listwise)	224				

4.4 K-Means Clustering

After running the K-Means clustering algorithm[1], the cluster centers became stable after eight iterations and no further changes occurred. The clustering resulted in four clusters with the following distribution of data.

Table 3: Cluster Overview

Cluster Overview	Cases	Relative Size
Cluster 1	49	21,68%
Cluster 2	75	33,19%
Cluster 3	48	21,24%
Cluster 4	54	23,89%
	226	100,00%

This distribution shows a good balance between the clusters. The ANOVA Table 3 indicates that there is statistical significance for all plans at a confidence interval of 99%. This is also reflected in a high F-value, which indicates that the differences between the cluster centers are significant.

Table 4: K-Means ANOVA

ANOVA

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
Zscore(Plan1)	35,148	3	,534	220	65,779	<,001
Zscore(Plan2)	49,094	3	,344	220	142,642	<,001
Zscore(Plan3)	36,932	3	,510	220	72,412	<,001
Zscore(Plan4)	35,367	3	,531	220	66,561	<,001
Zscore(Plan5)	33,583	3	,556	220	60,434	<,001
Zscore(Plan6)	10,368	3	,872	220	11,886	<,001
Zscore(Plan7)	23,359	3	,695	220	33,606	<,001
Zscore(Plan8)	38,075	3	,494	220	77,008	<,001
Zscore(Plan9)	34,650	3	,541	220	64,032	<,001
Zscore(Plan10)	45,825	3	,389	220	117,876	<,001
Zscore(Plan11)	46,448	3	,380	220	122,150	<,001

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

A look at the final cluster centers, represented in a bar chart (Appendix 7.9), shows that there are statistical differences between the cluster centers. However, it is likely that not all variables

[1] A two-step clustering was also performed and yielded the same qualitative results

are significantly different in all clusters. To check this, a Posthoc test was carried out (Appendix 7.12). This revealed that, for example, the variable Plan 1 is not significantly different for Cluster 2 compared to Cluster 4. This applies to all variables and clusters for which the significance is not less than 0.05 (assuming a 95% confidence interval).

Nevertheless, the clustering was successful and can be used for further analyses of customer preferences within the clusters. The results of the significance of the variables, the F-values, the cluster centers and the cluster distribution provide valuable insights into the differences and similarities of the respondents' preferences.

Overall, this K-Means analysis shows that the identified clusters exhibit significant differences in the ratings of the various plans, providing a solid basis for further investigation and targeted marketing strategies.

4.4.1 Cluster 1 - Active Young Professionals

Cluster 1 contains 49 records. The highest-rated plan was Plan 8 with an average rating of 8.29, followed by Plan 1 with 7.86. Excluding Plan 3, which was rated the lowest across all clusters, Plans 5 and 9 received the lowest average rating of 3. This cluster exhibited notably smaller standard deviations, indicating similar preferences for the different plans, with ratings ranging from 7 to 10 for Plans 1 and 8.

The average age of individuals in this cluster is 33.98 years, making it the youngest cluster. A significant majority, 71.4%, are aged between 18 and 35 years. Gender representation is balanced within the cluster.

This cluster is characterized by high income levels, with slightly less than one-third of individuals earning €100,000 or more. Additionally, 44.9% earn between €65,000 and €100,000, while no individuals in this cluster earn less than €20,000.

In terms of physical activity, 83.6% of individuals are moderately to regularly active, and this cluster has the highest proportion of extremely active individuals at 14.3%. Regarding the use of healthcare services, the majority of individuals (75.5%) visit these services rarely or occasionally, making it the cluster with the least reliance on healthcare institutions.

The conjoint analysis revealed that the constant utility, or the utility without add-ons, is 5.533, the highest value compared to all other clusters. The highest relative utility in this cluster comes from fitness trackers (1.268) and travel insurance (1.253), with both add-ons showing the

highest values compared to other clusters. Adding an online medical record increases utility by 1.166 and offering health saving accounts would raise utility by 0.931, making this the only cluster with a positive utility increase from HAS.

The weakest utility is associated with psychological support, where the addition of this add-on actually decreases utility by -0.335. This is the only negative utility addition for Cluster 1, as all other add-ons provide a positive utility increase. The second-lowest utility increase comes from smart contracts (0.130), followed by telemedicine (0.446).

This cluster values the ability to reduce contributions, aligning with their high level of physical activity and preference for fitness trackers and health saving accounts. They exhibit a risk-taking attitude and generally have a positive view of their health trajectory, which correlates with their young average age and minimal use of healthcare institutions. Consequently, additional services like psychological support are less valued, and they do not anticipate

increased future usage of healthcare services, indicating that faster reimbursement options are not highly prioritized.

4.4.2 Cluster 2 - Health-Conscious Middle Agers

Cluster 2 is the largest, comprising 75 observations, with an average age of 45.35 years. This places it in the middle-aged group along with Cluster 3, with 68% of individuals aged between 36 and 55 years, and 17.3% aged 56 or older. Gender representation within this cluster is balanced.

Plan 4 received the highest average rating of 7.71, followed by Plans 7 and 10, each rated at 7.24. Plans 3 and 9 were rated the lowest, but these plans include fewer add-ons, making these ratings less significant. Among the plans with three or four add-ons, Plan 11 was rated the lowest at 2.67, and Plan 1 received an average rating of 4.27.

Healthcare service usage varies among individuals in this cluster, with 54.7% using these services regularly or frequently, the second-highest usage rate after Cluster 4. This is notable compared to Cluster 3, which has a similar age structure but uses healthcare services much less frequently.

Cluster 2 is characterized by middle to lower income levels, with 45.3% earning between €20,000 and €65,000, the highest proportion across all clusters. The remaining individuals are

almost evenly split between the higher income categories (€65,000-€100,000 and €100,000+). Physical activity levels are generally lower in this cluster compared to Cluster 1, with only 13.3% engaging in regular sports, 36% being moderately active, and the largest group (37.3%) engaging in minimal physical activity.

The conjoint analysis revealed a base utility of 5.045, indicated by the constant. Add-ons do not provide as much utility for Cluster 2 as they do for Cluster 1. However, telemedicine increases utility by 1.198, the highest increase among all clusters. Psychological support adds 0.885 to the utility, and fitness trackers add 0.842. Notably, Cluster 2 uniquely associates psychological support with positive utility. Other add-ons provide the following utility increases: smart contracts (0.752), travel insurance (0.702), and online medical records (0.602). Health savings accounts (HSAs) are not favored, reducing utility by 0.388.

Cluster 2 values additional services such as psychological support, telemedicine, and travel insurance more than options to minimize contributions. Although fitness trackers increase average utility, the cluster members are not very physically active. They exhibit a risk-averse attitude, with health saving accounts not providing any benefit; in fact, they decrease utility. Preferences are shaped by a high utilization of healthcare services, making faster reimbursement highly advantageous.

4.4.3 Cluster 3 - High-Income Skeptics

Cluster 3 is the smallest cluster, containing 48 records, with an average age of 44.19 years. It is evenly split between men and women, each representing 50% of the cluster. The age distribution is balanced, with 41.7% younger than 35, 25% between 36 and 55, and 33.3% older than 56. This cluster is characterized by high-income individuals, with 45.8% earning €100,000 or more annually. Alongside Cluster 1, it is among the highest income groups, with approximately 70% falling into the top two income categories.

A significant portion of this cluster (68.8%) reports moderate physical activity, the highest cross-cluster rate. Nearly half (47.9%) use healthcare facilities regularly, while the remainder use them occasionally (20.8%) or rarely (20.8%).

Plan 8 received the highest average rating of 6.27 in this cluster, which is notably lower than the top ratings in other clusters. This cluster is marked by very high standard deviations,

reflecting highly volatile ratings with scores for most plans ranging from 1 to 10. Preferences within this cluster are highly varied. Plan 10 received the lowest average rating of 3.10.

The base utility for this cluster is 5.010. This cluster exhibits a distinctly pessimistic view of add-ons, with four out of seven add-ons providing a negative relative utility. In general, add-ons do not significantly enhance utility compared to other clusters, and this cluster does not exhibit the highest or lowest utility changes for any add-ons. The highest relative utility is from telemedicine at 0.786, followed by travel insurance at 0.568 and smart contracts at 0.469. The other add-ons have a negative utility, with fitness trackers being the most negatively perceived at -0.609. Similar negative relative utilities are found for psychological support (-0.214), health savings accounts (-0.229), and online medical records (-0.219).

This cluster does not derive substantial benefit from the add-ons and shows little interest in the possibility of reduced contributions, indicating that the potential for lower premiums holds no significant relevance for this group.

4.4.4 Cluster 4 - Senior Health Dependents

Cluster 4 consists of 52 observations and is the oldest cluster by far, with an average age of 61.94 years. A significant majority, 76.9%, are aged 56 or older. There is a slight male predominance, with men making up 57.7% of the cluster. Plan 7 received the highest average rating of 8.54, making it the highest-rated plan across all clusters, followed by Plan 6 with a rating of 6.92. The lowest-rated plans were Plan 9 (2.06) and Plan 2 (2.67).

This cluster has the highest frequency of healthcare usage, with 40.4% of individuals frequently using healthcare services. Over half of the cluster (51.9%) uses these services regularly, the highest percentage among all clusters, while only 7.7% use healthcare services rarely or occasionally. Reflecting this high dependency on healthcare facilities, the cluster is largely inactive physically, with 40.4% engaging in minimal physical activity and 53.8% reporting moderate activity.

The conjoint analysis revealed that this cluster has the highest relative utility for the add-on smart contracts (1.329), and online medical records also provide significant utility (1.272). This indicates a high reliance on healthcare services. Other add-ons like fitness trackers (0.575) and telemedicine (0.546) also add value, though to a lesser extent. Travel insurance provides a relative utility of 0.459. However, psychological support (-0.147) and health savings accounts

(-0.911) have a negative relative utility. This reflects the cluster's risk-averse nature, preferring to rely on established healthcare services rather than options that might reduce costs through increased self-management.

4.5 Demographical Analysis

The clustering of the data using the k-means method was based on the ratings for the individual health care plans. This results in homogeneous clusters based on these preferences. The survey also collected demographic data and data on physical activity and use of health facilities. These are useful for examining the clusters with regard to these factors and gaining further insights. A one-way analysis of means (Appendix 7.11) is carried out for this purpose. This is limited to the demographic data only, excluding the control variable for German insurances and the variables health and sport.

As a result, there is no statistical significance between the clusters for the mean value for demographic variables such as insurance, job and gender. This means that these variables have no significant influence on membership of certain clusters. In contrast, there is statistical relevance for the variables health, sport and income. Indicated by the significance below 0.05 taking into account a 95% confidence interval. A Posthoc test is carried out to analyze these in detail and to compare the clusters with each other. This is used to perform a for multiple pairwise comparison of the clusters (Gibbons & Chakraborti, 2011; Benavoli, Corani & Mangili, 2016).

The test shows that no cluster for each variable has a significant difference to all other clusters. A representative example would be the comparison of cluster 1 and cluster 4. Which shows clear differences between health status and sporting activity. These were the two extreme clusters, whereby the statistical significance can be confirmed by the post hoc test (at the 95% confidence interval). However, there is no significance for the variable income.

4.6 Discussion

The analysis revealed several revealing observations. In particular, it must be noted that a conjoint analysis across a heterogeneous data set hardly provides usable and informative data for a company. Of course, the preferences of the people surveyed are represented. However, they are distorted and do not reflect the same preferences if the survey groups were segmented.

In this analysis, this means in detail that the Health Saving Accounts add-on would represent a negative benefit for all respondents, and it would therefore not be advisable to offer it. In the event that the majority of young premium payers with low insurance costs were to be won over, the offer would be made. For Cluster 1, it is a beneficial add-on. The preferences clearly differ between the clusters. Only the add-ons Smart Contracts, Travel Insurance and Telemedicine represent a potential benefit for all clusters. Even if not to the same extent. Calculating the benefits for the individual health care plans results in different favorites for all clusters (Appendix 7.7). To determine the benefit of a plan for a cluster, the coefficients are added to the constant with a positive or negative sign, depending on whether the plan is offered or not. In the case of Cluster 2 and Plan 1, this means:

$$5.533 + 1.268 + 0.355 + 0.13 + 0.931 + 1.253 + (-0.446) = 9.024$$

This results in a benefit of 9.024, which is the highest of all plans and clusters. All clusters would derive the most benefit from a different plan. Only cluster 4 is identical to plan 7 with the highest benefit if no segmentation is performed. Although cluster 4 would also achieve a higher benefit.

Comparing the clusters in terms of relative importance (Appendix 7.5). The values are computed by taking the utility range for each factor separately and dividing by the sum of the utility ranges for all factors. This results in a somewhat more homogeneous picture. For the analysis with All data, as well as clusters 2 and 3, the Telemedicine add-on has the greatest influence on preference. This results from a wide range of preference for this add-on within the group. For cluster 1, this importance lies with Fitness Tracker and for cluster 4 with Smart Contracts. As a result of this analysis, it is not advantageous for health insurance companies to offer add-ons without a plan. There is also no add-on that would be included in a benefit-maximizing health care plan for all clusters (Appendix 7.8). If the scenario were to be assumed that a maximum of four add-ons could be added to the basic tariff. For cluster one, for example, this benefit-maximizing health care plan would include the add-on travel insurance, but not for cluster 4. Only the fitness tracker would appear in the benefit-maximizing plan for 3 out of 4 clusters. The peculiarity is that cluster 3 would only benefit from three add-ons. Now, of course, one could argue that customers would derive a positive benefit from every add-on as long as it does not include a price surcharge or is voluntary like the Health Saving Accounts. Then, for example, you could add the fitness tracker option to cluster 3 and this add-on would then be optimal for all clusters. Mathematically, according to the regression, the bundle would no longer

maximize the benefits for cluster 3, but this can be ignored as the benefits of one add-on were only measured relative to the others. It can be said that every add-on has a benefit for a certain customer group and there is no add-on that would be clearly rejected by every cluster.

5.0 Conclusion and Limitations

5.1 Conclusion

The insurance market is highly competitive and undergoing change. The idea is for insurance companies to develop into a partner at the side of the insured, covering the customer's needs and supporting them in leading a healthy life. To this end, insurance plans are becoming increasingly flexible and individualized. The aim of this work was to investigate the relative preferences of add-ons to a basic health insurance plan. This gives insurance companies the opportunity to design insurance plans in such a way that they appeal to specific target groups. The analysis has shown that this is necessary. As no plan addresses all target groups and their needs equally. While plan 1 is the most beneficial for cluster 1, this is not the case for the other clusters. The impression of a general conjoint analysis (all data is analyzed together without clustering) is also deceptive. If insurance companies were to follow such an analysis without market segmentation, the plan would address 7 and thus cluster 4. Ultimately, however, this is the cluster that represents the least favorable insured people for an insurance company. This is due to a high average age, whereby increased costs are to be expected. The insurance company would price in the risk through risk selection. Insurance companies prefer young and healthy customers where it is possible to build up old-age provisions. In this analysis, this represents cluster 1, which is characterized by the lowest average age and low use of healthcare facilities. This cluster derives the highest benefit from Plan 1 and is intent on reducing benefit contributions through its behavior. In general, this cluster is characterized by very high benefit values. The selection of add-ons appealed most to this cluster, which is also underpinned by the highest basic benefit (constant). This may be due to the sometimes very innovative and technologically based add-ons. It can be assumed that the younger generation is more familiar with the technology and therefore has a greater interest in and acceptance of it. This was not taken into account in this analysis but was. The cluster is also interesting as it is the only one that assigns a positive relative benefit to the health saving account add-on and is even integrated into the benefit-maximizing health care plan. This add-on is very complex and has its origins in the USA. The preference for this add-on indicates a higher risk appetite. This add-on is still

unexplored for German insurance companies. However, this analysis shows that such a system with an increase in the deductible and a simultaneous reduction in premiums would be interesting for a certain customer group. In this case, this applies to cluster 1, which is also the most relevant for health insurance companies. The implementation and the legal framework are still very unclear. However, insurance companies could intensify their efforts to offer such a tariff and review it for economic efficiency and legal and tax feasibility. Implementation would change the calculation of premiums and cost estimates. However, such a tariff would increase the attractiveness for a younger target group. The work has shown that a more flexible and innovative health care plan design would be beneficial. However, the target group must be precisely defined, as there is no add-on that is beneficial for all groups. In general, however, it can be stated that the telemedicine add-on was the most beneficial for all clusters. In terms of the relative importance of this factor, the highest percentage figure was also found. The relative importance differs from cluster to cluster. However, this add-on is assigned the greatest relative importance by clusters 2 and 3, and thus over 50% of respondents. Health care status, sporting activity and, to a certain extent, income have an influence on respondents' preferences. This is advantageous for insurance companies as they can use these characteristics to segment and evaluate preferences in the future. As a result, health care plans can be more individualized and target groups can be designed more specifically.

5.2 Limitations

To add transparency and credibility to the research it is necessary to represent the limitations of the study. This could also give guidance for future research (Price & Murnan, 2004).

There are several limitations of this study, which are of different nature. Firstly, the conjoint analysis methodology itself has some weaknesses. It is assumed that consumers always think rationally when comparing different products and services (Wyner, 1992). However, the process of decision making in reality is much more complex and is influenced by other factors (Simon, 2015). Such factors as external influences such as the sense of smell influence the purchase decision. This means that preferences cannot be translated into purchasing behavior. However, the preferences that a conjoint analysis is supposed to reveal can also be wrong. The conjoint analysis has the false assumption that precise, stable preferences are the key determinants of individuals' choices (Gal & Simonson, 2021). Apart from the methodic limitation, a large part of the limitation lies in the choice of add-ons. Starting with the informal

interview, the selection of interviewees cannot be representative. This means that possible add-ons cannot be taken into account. This is therefore problematic, as the preferences investigated are only relative in comparison to the other add-ons. This means that if the composition of the health care plans were different with other add-ons, the preferences could be different.

In addition, some of the add-ons are fictitious, meaning that implementation in reality is still difficult to imagine at this stage, which limits the information content for insurance companies at this stage of the study. The complexity of some add-ons was also reduced to a minimum in the survey for reasons of simplification. In reality, the possibility of a Health Saving Account must be calculated in detail. This means that the insurer would have to calculate the expected payments of each customer on the basis of probabilities and therefore specify exactly how much the premium can be reduced and how high the excess would have to be. In general, insurance is a complex financial product that must be carefully evaluated by the customer, and, for example, the benefits and price catalog must be compared. In general, the influencing factor of price is missing in the entire conjoint analysis. Price is still a decisive factor in the customer's decision (Andreti et al., 2013). This means that a customer prefers a certain attribute, but not for every price. In this study, the price factor was not considered as it was fixed. This could tempt the survey participants to a certain extent to choose the add-ons that would be most expensive on the open market. The survey as part of the methodology is also limited by several factors. As the survey relates to German private health insurance, it is difficult to assess the preferences of people with statutory health insurance. As both systems cover different ranges of benefits, the picture may be distorted by participants with statutory health insurance. In addition, the health care plans to be evaluated were limited by the orthogonal design, otherwise the survey participants would be overwhelmed and unable to compare and rate the product bundles. Nevertheless, a survey with a larger number of product alternatives to be evaluated (for example by increasing hold-out cases) would make the analysis results much more precise. A survey also has a limited depth (Price & Murnan, 2004). In this case, it was relevant to determine the health status of the respondents and to assess how well the respondent was familiar with the health institutions. To simplify this, the frequency of use of health institutions was asked. This has the advantage that the insured person has a number or frequency of possible costs. However, this says nothing about the amount of these costs. As there is no specification of which treatment was undertaken. Nor does this question provide any clear information about the person's state of health. It can be assumed that increased use of the institutions is due to poorer health, but this is not necessarily always the case (Sulku & Tokatliglu, 2023). Such

statements cannot be used by insurance companies to estimate cost trends on this basis. It is also not possible to assume in this form that people who make frequent use of healthcare services are more familiar with them. Accordingly, the influence of health status and prior knowledge is only applicable to a limited extent.

5.3 Implications

The analysis has shown that there is no investigated add-on that is suitable for all customer groups. Healthcare providers should therefore develop a range of customizable plans tailored to different demographic groups. These different preferences highlight the need for a customer-centric approach to insurance product design. To gain valuable insights, the insurance sector should regularly conduct market research and gather customer feedback through surveys. This work shows that scientific research can also help insurers in real-life scenarios. By recognizing the importance, researchers can be commissioned to investigate possible future product features in specific scenarios. The details of this study show that the younger generation perceives HSA as an increase in benefits. Insurers can use this insight to promote such programs in a more targeted way and include them in their product offerings. This can be paired with financial education on how to effectively manage health finances. With the introduction of HSA accounts, the calculation of contributions also needs to be revised. Methods need to be adapted, particularly in the area of underwriting. Risks are changing and changes would also be noticeable in the area of old-age provision. Insurance companies must take account of the changed conditions in their investment strategy.

In addition, a high level of acceptance was seen with regard to technologically secure developments in the area of healthcare. Be it through the use of blockchain-based smart contracts or centralized online health records. These technologies require customer trust in data security and transparency. Customer groups see the need for technological innovation. This should prompt insurance companies to integrate these technologies into their product offering. As some technologies are still at an early stage, strategic partnerships are essential. Health insurers could commission external companies to create the technical requirements, e.g. for a standardized telemedicine service. This requires the cooperation of as many healthcare facilities as possible. In addition, the regulatory framework conditions should be evaluated in advance, particularly in the area of blockchain and data security. Intensive lobbying could accelerate the process of simplifying the legal requirements.

5.4 Future Research

This work was limited by time and scope. In order for insurance companies to derive real added value from the conjoint analysis, it must be made more precise. In particular, the add-ons such as HSA could be worked out more precisely with the company's own data. This would allow the price factor to be included so that the relative willingness to pay can be estimated for each attribute. The biggest area that can be explored in future analyses is in the area of acceptance of new technologies. This work includes the add-ons, Online Medical Record and Smart Contracts technologies that are arranged in the area of blockchain and cryptography. This is very topical and has not yet reached a broad section of society. It would be interesting to see how and whether blockchain can support insurance in this field. Above all, however, it is necessary to investigate the acceptance of the use of such technologies, for example in the storage of patient records. To do this, however, it is necessary to fully understand how it works and the mechanisms involved. This will ensure a precise and reliable assessment of the target group and their preferences.

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7.0 Appendix

7.1 Initial Example of Attributes

Attribute	Level 1	Level 2	Level 3
Price	Low	Middle	High
Payment	Monthly	Quarterly	Annually
Cover Rate	Basis	Standard	Premium
Deductible	None	Middle	High
Waiting Time see Doctor	Low	Middle	High
Network	Inside network	Out of network	
Customer Service	24/7 hotline	Online chat (AI)	Personal advisor
Termination	Monthly	Annually	Several Years
Travel Insurance	Yes	No	
Bonus Programm	Yes	No	
Telemedicine Services	Yes	No	
Use of Smart Contracts Insurance Claims	Yes	No	
Fitness Tracking	Yes	No	
Psychological Support	Yes (restricted)	No	Yes
Premium Refund	Yes	No	
Family Insurance			

Fundamentals	
Changing customer preferences	
Digital transformation	

7.2 Orthogonal Design

Card List

	Card ID	Fitness Trackers	Psychological Support	Smart Contracts	Health Saving Accounts	Travel Insurance	Online Medical Record	Telemedecine
1	1	Yes	No	Yes	Yes	Yes	No	No
2	2	Yes	Yes	No	Yes	No	Yes	No
3	3	No	No	No	No	No	No	No
4	4	Yes	Yes	No	No	Yes	No	Yes
5	5	No	Yes	Yes	Yes	No	No	Yes
6	6	No	Yes	Yes	No	Yes	Yes	No
7	7	Yes	No	Yes	No	No	Yes	Yes
8	8	No	No	No	Yes	Yes	Yes	Yes
9[a]	9	No	No	Yes	Yes	No	No	No
10[a]	10	Yes	No	No	No	No	Yes	Yes
11[a]	11	Yes	No	No	Yes	No	Yes	No

a. Holdout

7.3 Survey

English

Survey on customer preferences for health care insurance Add-ons by Dario Abidi **(duration: approx. 5 minutes)**

In the course of my Master thesis at FGV EBAPE and Católica Buisness School, I am currently researching on customer preferences towards Add-ons for health care plans. The study is focused on the private health care plans in Germany and should support health care providers to target customer preferences more effectively.

I would be very grateful if you could answer the following 11 questions and evaluate the different Add-ons according to your personal preference.

All the answers should be made by personal preference without hesitation of wrong and right. The answers will be treated completely discrete and anonymously. **If you have already answered the survey, please do not fill it out again.**

All participants will be entered into a raffle for 5 x 10 euro Amazon gift vouchers.

I highly appreciate your help and for any further question or more detailed insides please contact me via dario.abidi@gmail.com.

→

Please imagine the following scenario:

You are currently insured by the private health insurance Católica Life Insurance. The company offers you different Add-ons to your current basic plan without any additional charge. Your current basic plan serves all basic needs, and it is standardized between all insurance companies. It's oriented by the basic mandatory health insurance plan.

Please read the 7 different Add-ons carefully and have them in mind when you rate the different bundles.

Fitness Trackers: The insurance company offers you to wear fitness trackers to measure your fitness level. As a customer, you can achieve prescribed fitness targets and thus receive refunds or discounted conditions. The targets are moderate and are based on the guidelines of the WHO organization and include, for example, 10,000 steps a day and 150–300 minutes of moderate-intensity aerobic physical activity.

Travel Insurance: This insurance offers free worldwide travel insurance for the insured person. The conditions are identical to the tariff within Germany and apply for trips lasting up to 6 weeks.

Online Medical Record: The insurance company has its own data platform. Through its use, the medical history, including diagnoses, treatments, medications, and test results, is recorded as a series of encrypted transactions on the blockchain. The insured person is authorized to access this data and can share the data with any healthcare provider using standardized data exchange methods. These in turn can edit and add to the entries in real lifetime.

Telemedicine: The insurance company has its own platform where healthcare providers can be reached digitally via video conferencing, phone calls, text messaging, and secure online portals. Use is not mandatory and can be decided on a case-by-case basis.

Psychological Support: The insurance pays for a 45-minute session with a psychological therapist once a quarter free of charge. The benefit is universal. In addition, you will be provided with an AI-based psychotherapeutic chatbot that you can use free of charge at any time.

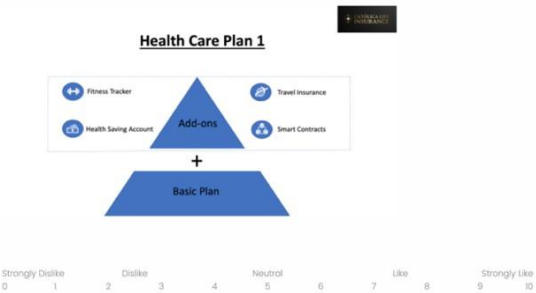
Smart Contracts: The insurance company uses blockchain-based smart contracts to check claims and payouts. The claim process is thus automated and benefit settlements can be mac within 24 hours.

Health Saving Account: The insurance company offers to introduce so-called health savings accounts. The customer can then deposit money there privately (which can only be used for medical purposes, e.g., visits to the doctor or medication). The amount can change and be decided by personal preference. In return, the premium rate is reduced. The money does not earn interest and remains available unchanged in the future. The insurance company doubles the money paid in, but the deductible increases from 5% to 50%. Out of the pocket amount (maximum) to an amount of 2000 euros.

The following 11 combinations represent the different health care plans. Remember the basic plan is standardized and only the Add-ons differ from offer to offer. These can either extend your range of benefits, change the operational efficiency, or enable you to reduce your premiums.

→

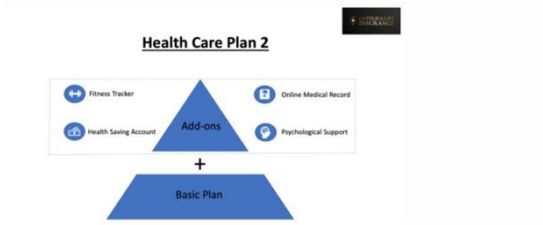
Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)



Strongly Dislike 0 | Dislike 1 2 3 4 | Neutral 5 | Like 6 7 8 | Strongly Like 9 10

Plan 1

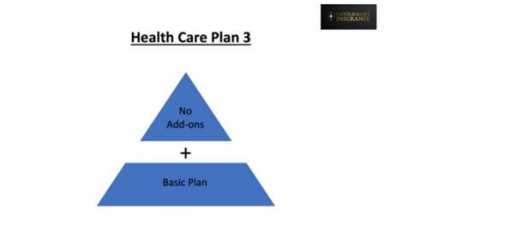
Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)



Strongly Dislike 0 | Dislike 1 2 3 4 | Neutral 5 | Like 6 7 8 | Strongly Like 9 10

Plan 2

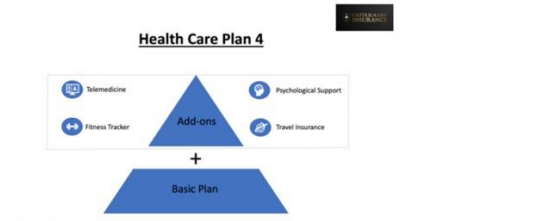
Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)



Strongly Dislike 0 | Dislike 1 2 3 4 | Neutral 5 | Like 6 7 8 | Strongly Like 9 10

Plan 3

Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)



Strongly Dislike 0 | Dislike 1 2 3 4 | Neutral 5 | Like 6 7 8 | Strongly Like 9 10

Plan 4

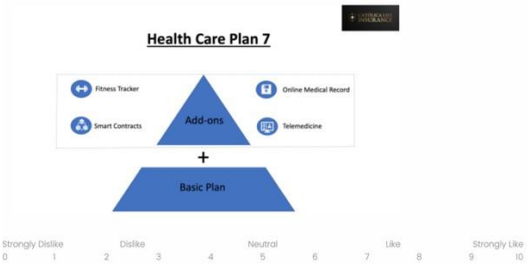
Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)

Plan 5

Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)

Plan 6

Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)

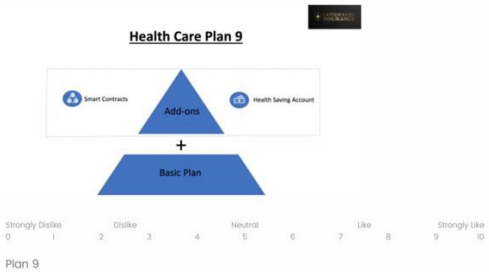


Plan 7

Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)

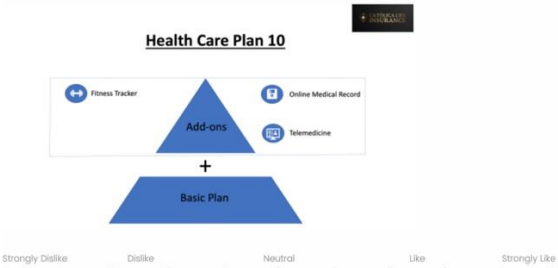
Plan 8

Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)



Plan 9

Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)



Plan 10

Rate this bundle based on your personal preference from 0 – 10 (whereby 0 means you don't like the bundle at all and 10 means you like the bundle a lot)

Plan 11

How often do you use the health care infrastructure?

- ○ Never
- ○ Rarely (1-2 times a year)
- ○ Occasionally (3-5 times a year)
- ○ Regularly (6-8 times a year)
- ○ Frequently (8+ times a year)

→

How much sport do you do?

- ○ None (no active physical activity)
- ○ Minimal (less than 2 hr a week active physical activity)
- ○ Moderate (2-4 hr a week active physical activity)
- ○ Regular (4-6 hr a week active physical activity)
- ○ Intense (more than 6 hr a week active physical activity)

→

What is your current health care status?

- ○ Private health insurance
- ○ Governmental health insurance
- ○ Governmental health insurance with private health adds
- ○ No health insurance
- ○ Other

→

Do you have a German health insurance?

- ○ Yes
- ○ No

→

What is your annual income before tax?

- ○ under 20k
- ○ 20k - 65k
- ○ 65k - 100k
- ○ 100k and more

→

What is your current job status?

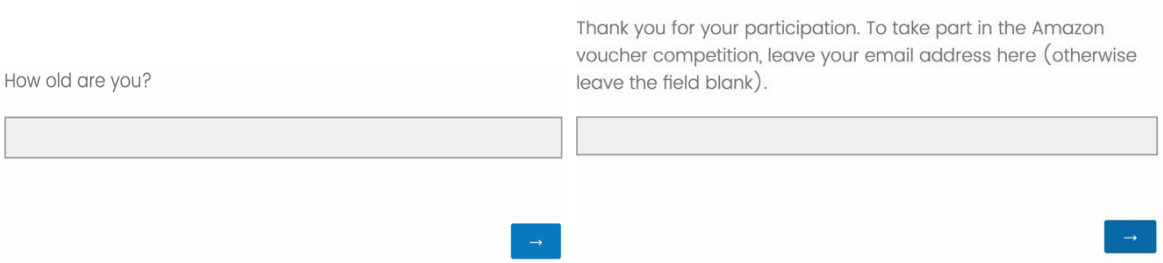
- ○ Student
- ○ Self-employed
- ○ Employee
- ○ Civil servants
- ○ Unemployed
- ○ Retired
- ○ Other

→

What is your gender?

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Prefer not to say

→



7.4 Dataset

ID	Plan1	Plan2	Plan3	Plan4	Plan5	Plan6	Plan7	Plan8	Plan9	Plan10
1	7	6	1	7	3	5	6	9	3	6
76	3	5	1	9	6	5	7	6	0	7
162	5	4	0	6	6	7	9	3	2	5
99	3	3	1	4	2	8	7	4	1	6
41	7	6	1	6	4	4	6	9	2	5
159	4	4	1	7	5	7	7	4	1	6
171	4	2	1	10	7	2	5	1	7	6
186	1	0	3	9	5	8	6	5	5	3
51	3	5	0	9	4	7	6	6	1	8
90	4	4	1	9	5	6	6	5	1	8
103	3	3	0	3	4	7	8	4	1	6
109	5	3	1	5	2	6	9	5	1	6

Plan11	Health	Sport	Insurance	German	Income	Job	Age	Gender	Cluster
7	2	3	2	1	4	3	22	0	2
2	3	3	2	1	2	2	50	1	1
4	3	1	2	1	2	6	33	0	1
3	3	3	1	1	4	2	69	1	4
6	2	3	1	1	4	4	37	0	2
5	2	2	2	1	4	6	60	1	1
4	3	3	2	1	3	4	21	1	3
1	2	3	2	1	4	5	65	1	3
2	4	3	2	1	3	2	53	0	1
2	4	4	3	1	2	2	62	0	1
5	4	3	1	1	2	2	63	0	4
3	3	2	2	1	4	4	70	0	4

7.5 Relative Importance

Add-on	All Data	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Fitness Tracker	14,74%	22,85%	15,68%	19,70%	10,97%
Psychologischer Support	3,64%	6,39%	16,49%	6,90%	2,80%
Smart Contracts	18,07%	2,35%	14,00%	15,15%	25,38%
Health Saving Accounts	4,90%	16,78%	7,23%	7,41%	17,39%
Travel Insurance	19,33%	22,58%	13,07%	18,35%	8,77%
Online Medical Record	18,48%	21,01%	11,21%	7,07%	24,28%
Telemedicine	20,83%	8,05%	22,32%	25,42%	10,42%
	100,00%	100,00%	100,00%	100,00%	100,00%

Highest relative importance

7.6 Relative Utilities

Add-on	Level	All Data	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Fitness Tracker	No	-0,562	-1,268	-0,842	0,609	-0,575
	Yes	0,562	1,268	0,842	-0,609	0,575
Psychological Support	No	-0,139	0,355	-0,885	0,214	0,147
	Yes	0,139	-0,355	0,885	-0,214	-0,147
Smart Contracts	No	-0,689	-0,13	-0,752	-0,469	-1,329
	Yes	0,689	0,13	0,752	0,469	1,329
Health Saving Accounts	No	0,187	-0,931	0,388	0,229	0,911
	Yes	-0,187	0,931	-0,388	-0,229	-0,911
Travel Insurance	No	-0,737	-1,253	-0,702	-0,568	-0,459
	Yes	0,737	1,253	0,702	0,568	0,459
Online Medical Record	No	-0,705	-1,166	-0,602	0,219	-1,272
	Yes	0,705	1,166	0,602	-0,219	1,272
Telemedicine	No	-0,794	-0,446	-1,198	-0,786	-0,546
	Yes	0,794	0,446	1,198	0,786	0,546
Constante		4,953	5,533	5,045	5,01	4,219

7.7 Health Care Plans and Utilities

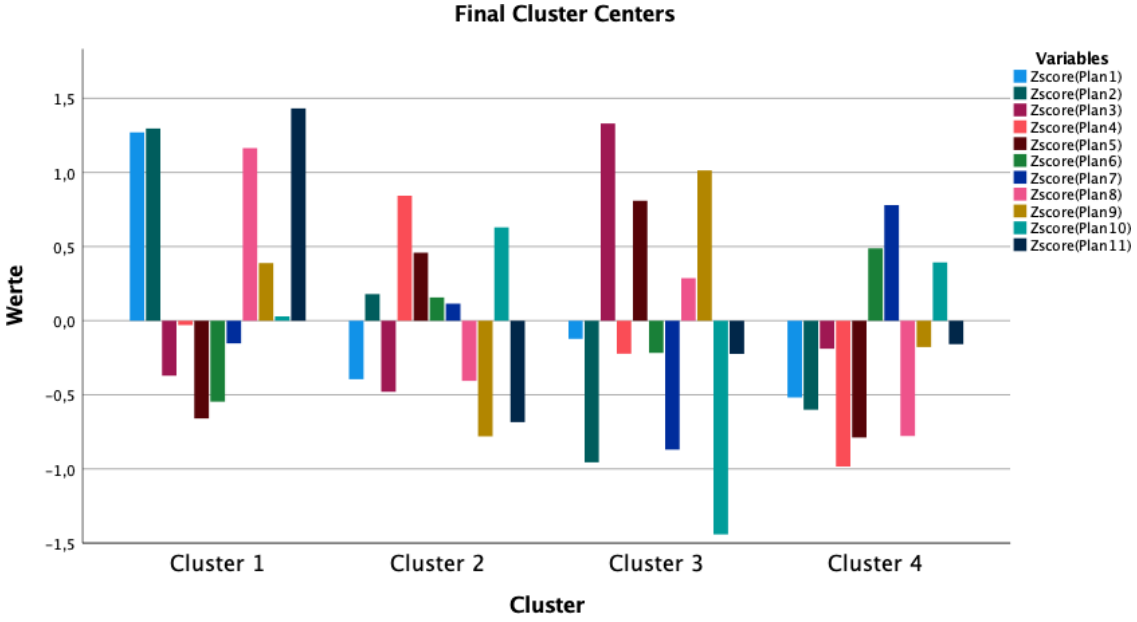
Product Option	All Data	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Plan1	5,82	9,024	4,87	4,637	5,272
Plan2	3,95	6,714	4,334	1,916	2,674
Plan3	1,51	0,694	0,452	4,458	1,096
Plan4	5,98	5,918	7,706	5,52	3,962
Plan5	4,38	2,998	5,346	6,082	2,73
Plan6	6,17	3,468	7,326	6,102	7,096
Plan7	7,01	6,714	7,24	5,312	8,54
Plan8	5,61	8,286	4,68	6,27	3,828
Plan9	2,52	2,816	1,18	4,938	1,932
Plan10	5,64	6,454	5,736	4,374	5,882
Plan11	3,67	7,424	2,564	2,344	2,968

Highest utility

7.8 Utility-maximizing Health Care Plans

	Utility-maximizing plans			
All Data	Smart Contracts	Travel Insurance	Online Medical Record	Telemedicine
Cluster 1	Fitness Tracker	Health Saving Accounts	Travel Insurance	Online Medical Record
Cluster 2	Fitness Tracker	Psychological Support	Smart Contracts	Telemedicine
Cluster 3	Smart Contracts	Travel Insurance	Telemedicine	
Cluster 4	Fitness Tracker	Smart Contracts	Online Medical Record	Telemedicine

7.9 K-Means Final Custer Centers



7.10 K-Means Iteration History

Iteration History[a]

Iteration	Change in Cluster Centers 1	2	3	4
1	4,019	4,401	3,119	4,326
2	1,235	,392	1,058	,849
3	,091	,285	,563	,298
4	,000	,111	,274	,134
5	,000	,000	,178	,157
6	,000	,000	,074	,069
7	,000	,000	,079	,074
8	,000	,000	,000	,000

a. Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is , 000. The current iteration is 8. The minimum distance between initial centers is 6,976.

7.11 ANOVA – Cluster Membership examined with Health, Sport, Income and Gender

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Health	Between Groups	45,606	3	15,202	19,241	<,001
	Within Groups	173,822	220	,790		
	Total	219,429	223			
Sport	Between Groups	33,175	3	11,058	18,451	<,001
	Within Groups	131,856	220	,599		
	Total	165,031	223			
Income	Between Groups	10,920	3	3,640	4,603	,004
	Within Groups	173,969	220	,791		
	Total	184,888	223			
Gender	Between Groups	,151	3	,050	,200	,897
	Within Groups	55,563	220	,253		
	Total	55,714	223			

7.12 Posthoc Test – Cluster Membership against Health, Sports and Income

Multiple Comparisons

Bonferroni

Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I–J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Health	1	2	-,634*	,163	<,001	-1,07	-,20
		3	-,500*	,181	,037	-,98	-,02
		4	-1,328*	,177	<,001	-1,80	-,86
	2	1	,634*	,163	<,001	,20	1,07
		3	,134	,164	1,000	-,30	,57
		4	-,694*	,160	<,001	-1,12	-,27
	3	1	,500*	,181	,037	,02	,98
		2	-,134	,164	1,000	-,57	,30
		4	-,829*	,178	<,001	-1,30	-,35
	4	1	1,328*	,177	<,001	,86	1,80
		2	,694*	,160	<,001	,27	1,12
		3	,829*	,178	<,001	,35	1,30
Sport	1	2	,926*	,142	<,001	,55	1,30
		3	,903*	,157	<,001	,48	1,32
		4	,960*	,154	<,001	,55	1,37
	2	1	-,926*	,142	<,001	-1,30	-,55
		3	-,022	,143	1,000	-,40	,36
		4	,034	,140	1,000	-,34	,41
	3	1	-,903*	,157	<,001	-1,32	-,48
		2	,022	,143	1,000	-,36	,40
		4	,056	,155	1,000	-,36	,47
	4	1	-,960*	,154	<,001	-1,37	-,55
		2	-,034	,140	1,000	-,41	,34
		3	-,056	,155	1,000	-,47	,36

*. The mean difference is significant at the 0.05 level.

7.13 Chi-Square Test and Crosstab against Health

Cluster Number of Case * Health Crosstabulation

Count

		Health				
		1	2	3	4	Total
Cluster Number of Case	1	14	23	11	1	49
	2	13	21	23	18	75
	3	10	10	23	5	48
	4	1	3	27	21	52
Total		38	57	84	45	224

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	58,238[a]	9	<,001
Likelihood Ratio	67,082	9	<,001
Linear-by-Linear Association	37,471	1	<,001
N of Valid Cases	224		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,14.

7.14 Chi-Square Test and Crosstab against Sport

Cluster Number of Case * Sport Crosstabulation

Count

		Sport					
		1	2	3	4	5	Total
Cluster Number of Case	1	0	1	23	18	7	49
	2	6	28	27	10	4	75
	3	0	14	33	1	0	48
	4	0	21	28	2	1	52
Total		6	64	111	31	12	224

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	73,291[a]	12	<,001
Likelihood Ratio	81,592	12	<,001
Linear-by-Linear Association	24,498	1	<,001
N of Valid Cases	224		

a. 8 cells (40,0%) have expected count less than 5. The minimum expected count is 1,29.

7.15 Chi-Square Test and Crosstab against Income

Cluster Number of Case * Income Crosstabulation

Count

		Income				
		1	2	3	4	Total
Cluster Number of Case	1	0	12	22	15	49
	2	6	34	19	16	75
	3	3	11	12	22	48
	4	4	18	19	11	52
Total		13	75	72	64	224

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	21,844[a]	9	,009
Likelihood Ratio	23,908	9	,004
Linear-by-Linear Association	,565	1	,452
N of Valid Cases	224		

a. 4 cells (25,0%) have expected count less than 5. The minimum expected count is 2,79.