The Influence and Considerations of Social Responsibility In Health Insurance Actuarial Science

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Abstract. In recent years, as the public pays increasing attention to social equity and sustainability, the health insurance industry is facing new responsibilities and challenges.This paper discusses the intersection between health insurance actuarial science and corporate responsibility. Traditional health insurance actuarial pricing models rely on the principle of actuarial fairness, where premiums are risk-based and charged higher for individual with greater risks. However, in response to the evolving ESG (Environmental, Social, and Governance) standards, insurers must expand their focus beyond narrow risk pools to societal impact. This paper examines the limitations of traditional health insurance actuarial models under new challenges, exploring how pricing mechanisms and product design can be reshaped to meet the evolving social expectations while remaining profitable. Moreover, this paper discusses the future directions in actuarial science for health insurance, pointing out some potential opportunities.

Keywords: Health Insurance, Actuarial Science, ESG, Corporate Social Responsibility, Insurance Pricing Models.

1. Introduction

The Global ESG investing trend and the society's growing emphasis on corporate responsibility and sustainability are reshaping health insurance actuarial science. As global awareness of social issues and environmental issues grows, corporate behaviour is not only evaluated by profitability and financial performance, but also by sustainability and social impacts[1]. This trend is particularly evident in the field of health insurance, which is widely considered to have the dual functions of risk protection and health management, helping forming a social welfare net[2]. Under the dual challenges of the exacerbating global social inequality and the social responsibility pressure on the insurance industry, the limitations of the traditional pricing model of health insurance are exposed, needing to be adjusted and improved.

This paper explores the impact of social responsibility on health insurance, analysing the directions of how to properly integrate it into the pricing mechanism and product design of health insurance to promote social equity while achieving profitability goals. This paper provides guidance on how actuarial science in health insurance can adapt to social developments and evolving investment trends. It not only offers strategic direction for the sustainability of the insurance industry, but also contributes to fostering a more equitable and inclusive health protection system, enhancing the well-being of the society, particularly the vulnerable groups.

2. Theoretical Analysis of Health Insurance Actuarial Science and Social Responsibility

2.1 Traditional Health Insurance Actuarial Pricing Model

Traditionally, the actuarial models health insurers used to set premiums are risk based. Actuaries determine premium pricing by analysing historical claims data and applying statistical methods, adjusting for demographic factors such as age, gender, and location, as well as industry characteristics, health status, and policy benefit design[3].

Based on the principle of actuarial fairness, premiums should reflect the risks of the insured and the expected losses of the claims, which prompt the insurers to classify risks according to diverse criteria and charge premiums that reflect the average risk profile of their class[4].As a result, individuals facing higher risks will be charged a higher premium. In

practice, this often means charging higher premiums for older or sicker individuals, or groups of people working in higher-risk environments[5].

Development of modern data analytics and ML technologies has effectively improved the previous statistical models like gender linear models (GLMs) or logistics regression, which allows handling big datasets for enhancing the accuracy of predicted health results. Models like RF regression have proved effective in providing more precise risk assessments and fairer pricing strategies by analysing demographic and health-related data, including age, BMI, sex, number of children, region, and medical charges[6].

2.2 The Connotation of ESG Investing and Corporate Social Responsibility

2.2.1 ESG Investing

In recent years, ESG (Environmental, Social, and Governance) factors have reshaped the expectations placed on companies by investors, regulators, and customers, as they are paying more attention to how the companies manage their social impact and maintain sustainability. Using criteria based on ESG considerations has become an increasingly important aspect of investment decision making[7].

In fact, studies have demonstrated that focusing on ESG factors is conducive to enhancing corporate performance. The systematic review by da Cunha et al. proves a positive relationship between ESG performance and corporate performance in long-term, suggesting that adopting ESG practices is beneficial in promoting the financial resilience and reputation of companies to attract investors[8]. Besides, ESG aspects also help to reduce the operational, regulatory and legal risks of corporates, enhancing their competitive position in the market.

2.2.2 Corporate Social Responsibility (CSR)

Under global ESG investing trends, corporate social responsibility (CSR) is no longer regarded as a charitable concern, rather, it has become a strategic necessity.

Under the guidance of CSR, companies are not only encouraged to promote ethics, fairness, transparency, and accountability in all their dealings, but also to keep their activities attuned to society's ethical, legal, and communal aspirations[9]. This requires companies to treat all stakeholders equitably and contribute meaningfully to societal progress.

In summary, in a global economy increasingly focused on sustainability, CSR, which is often included in a corporate's ESG strategies, is crucial to sustain the corporate's competitiveness and fulfill the growing expectations of stakeholders .

3. The Intrinsic Connection Between Health Insurance Actuarial Science and Social Responsibility

3.1 The social security function of health insurance

Kai-Uwe Schanz, head of Research & Foresight and director of Socio-economic resilience of the Geneva Association stated that paying more attention to the 'S' (social) aspect of ESG has become a broad consensus of businesses operations, particularly for the insurance industry, which is widely recognised as inherently socially beneficial. By providing risk hedging instruments and incentivizing prevention, insurers enable current and future generations to live and work in healthy and liveable conditions that promote diversity and equal opportunities, positively contributing to social sustainability[10].

As an important element of insurance, health insurance is closely related to everyone's life and serves several critical societal functions. It spreads risk across a large group, mitigating individuals' financial burden of medical expenses when suffering diseases. Furthermore, it also contributes to reducing health disparities and promoting health equity. For instance, research by Fan et al. found that integrated social medical insurance policies in rural China improved healthcare service utilization

and reduced disparities in healthcare accessibility[11]. It can be said that health insurance not only plays a crucial role in safeguarding an individual's physical health and financial stability, but also helps promote fairness, sustainability, and the overall well-being of society.

3.2 The challenges regarding social responsibility faced by traditional actuarial models

Social inequality directly shapes health insurance demand and challenges actuarial models. Under the traditional actuarial pricing models which are grounded in the principles of actuarial fairness, populations with higher risks will be charged higher premiums. However, in real-world cases, the limitations of this approach are obvious.

Firstly, in society, especially in developing countries, low-saving groups are often engaged in high-risk occupations to make a living. However, the high risk of their occupations means they are required to pay higher premiums, despite the fact that they are the ones who have greater demand for health insurance. As a result, low-income groups often find it difficult to obtain adequate insurance coverage due to affordability issues, which lead to a mismatch of supply and demand, exacerbating social inequality and wealth discrepancies. Besides, after assessing the insured's health status, insurance companies will often refuse to cover certain diseases. For example, they may refuse to cover diseases such as lung cancer for people whose lungs are already in poor health. This will result in the insured not being able to get protections for the diseases they are most likely to suffer from.

Additionally, by setting premiums based on the average value of the benefits, policyholders who have the most variation from the average may effectively experience richer or leaner benefits relative to the premium they pay[3].

Institute of Medicine has stated the principle underlying community rating and social insurance, which suggests that the risk of medical care expenses should be shared very broadly and that broad risk sharing across a community can help keep rates within reach of both higher-risk and modest-income individuals. This principle focuses on social equality from a societal perspective, which stands in contrast to the principle of actuarial fairness[5].

However, insurance companies are ultimately not charitable organizations after all, and generating profit is their primary objective. Therefore, how to strike a balance between profit-making goals and fulfilling broader social responsibilities remains a core challenge for insurers.

4. The Impact of Social Responsibility on Actuarial Models of Health Insurance

4.1 Background and Incentives

Generally, issues of asymmetric information arise as consumers know more than insurers, which can create moral hazard and adverse selection inefficiencies[12]. In the market for health insurance, the trade-offs of optimally designed product options that balance consumer preference for risk protection with minimizing moral hazard are typically managed by intermediaries. As an example, state and federal governments play an active role in determining insurance plan menus in the Affordable Care Act (ACA) marketplaces based on their specific conditions of different states, with some states restricting choice sets to only a few plans and others permitting a wide variety of options[13].

In broader contexts, governments of various countries directly or indirectly provide subsidies to low-income groups to cover insurance premiums. Such methods include the government fully covering premiums for eligible populations or using tax credits to subsidize them indirectly[14]. However, according to research of healthcare financing equity in low- and middle-income countries conducted by Asante et al., despite government subsidies, challenges still exist in achieving fair financing, as subsidies in some countries fail to effectively cover the most vulnerable groups, resulting in an uneven distribution of resources[15]. Besides, people being "stuck in the middle" may also struggle, as their income may not be high enough to afford desired insurance, but also not low enough to receive subsidies. Under the requirements of corporate responsibility, relying on

government supervision is obviously insufficient. Insurance companies should take the initiative to improve from the perspectives of risk adjustment plans and product design.

4.2 The impact on health insurance pricing mechanisms

To optimally address the diverse insurance needs of customers while effectively mitigating risks adverse selection risks, insurance companies need to further improve their pricing methodologies. For instance, they can make appropriate adjustments based on the customer's income level, paying ability, health status, social background, etc. Studies have found that incorporating health status indicators such as prior hospitalization and pharmaceutical cost groups into risk adjustment process can significantly reduce insurers' incentives to avoid high-risk individuals. It suggests that risk adjustment can be designed in a way as to effectively redirect insurers' efforts away from risk selection in favour of product innovation while using easily available information[16]. This can serve as a motivation and guidance for insurance companies to fulfill their social responsibilities by improving their pricing mechanisms.

Insurance companies may consider offering more flexible and generous installment payment schemes for financially disadvantaged and vulnerable groups. Such an approach can enhance both affordability and accessibility, enabling these groups to afford insurance premiums without compromising their ability to meet daily living expenses.

4.3 The impact on health insurance product design

Beyond pricing, insurers' social responsibility should also inform tailored health insurance product design for vulnerable group such as the elderly and individuals with low-income or poor health.

A good practice to meet the needs of low-income groups is to provide low-cost insurance options, such as micro-insurance. A study by Dror and Jacquier has proved that micro-insurance can significantly improve access to healthcare for low-income groups, reducing their financial burden of illness[17].

As for the elderly groups and individuals at high risk of certain disease, even if the insurers may refuse to directly underwrite the specific disease due to risks of adverse selection and huge losses, they can still offer some insurance choices such as health consultation, physical examination, and other services to help these groups take preventive measures or treatment guarantees. It may work by taking early, regular, low- early preventive care to reduce expensive interventions and treatment in the future.

Some countries like Australia have launched chronic disease management programs (CDMPs), and insurers play an important role in them. Research on chronic disease management programs (CDMPs) has revealed their potential as a strategic tool for insurers to fulfill social responsibility, which allows them to support groups with existing underlying diseases and chronic diseases that are usually excluded in the underwriting of regular critical illness insurance. These programs provide tailored treatment and health management plans for chronic diseases patients, including health coaching, dietary instructions and lifestyle support. In Australia, a legislative reform on private health insurance arrangement allowed health insurers to broaden their suite of products so they could cover disease management and health and wellness programs. However, the longer-term benefits of these programs remain to be assessed, and initial concerns around their negative impact still need to be addressed[18]. Globally, especially in developing countries, these programs have not been widely popularized in insurance companies. Therefore, it still requires further exploration and research to test its feasibility as a tool for insurance companies to fulfill their social responsibilities.

5. Future Directions

Currently, shortcomings in the design and pricing mechanisms of health insurance commonly exist, and the integration of social responsibility into health insurance actuarial practices is still in its formative stages. Addressing these gaps requires in more comprehensive assessments and innovations.

Actuaries need to further explore effective indicators to develop hybrid pricing models and innovative products, combining individual risk assessments with social indicators to balance actuarial fairness with social equity. With the rise of machine learning and big data analysis, insurers can make use of AI to better understand risk and demand patterns across diverse classifications. These technologies help identify underserved populations, assist insurers in designing products, refine the underwriting process and personalise policies. Additionally, more pilot programs are needed for innovative products to test their feasibility before widely introducing them. Potential risk such as moral hazard must be identified and addressed to avoid catastrophic loss and customer trust crisis.

6. Conclusion

This review highlights the critical need to integrate social responsibility into the actuarial science of health insurance under the global ESG investing trend. Traditional actuarial models, which are gronded in actuarial principles, have been effective in managing risks but often fallen short in adressing the evolving concerns around social equity. The conflict between the principles of actuarial fairness and social equity poses a significant chanllange to the advancement of health insurance actuarial models. There have been attempts to adjust pricing mechanisms and design special products, suggesting potential future directions. These include incorporating accessible health status indicators in pricing models, offering flexible and generous installment payment schemes, innovating miro-insurance and providing chronic disease management programs. However, further studies for those attempts such as long-term efficiency and feasible testing are yet to be completed. To move forward, actuaries in health insurance companies can take advantage of AI and big data analysis, further exploring effective indicators to develop hybrid pricing models and innovative products, and implementing more pilot programs for feasibility tests of the products.

There is still a long way to go to integrate social responsibility into health insurance actuarial science. Efforts are needed from not only actuaries and insurers, but also the regulators and the wider public. Through innovative actuarial approaches and a supportive regulatory environment, the health insurance industry can move toward a future where commercial success and social equity are not mutually exclusive but mutually reinforcing.

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