





## Legal responsibility for negative effects of the vaccine: Nature and financial compensation

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**Abstract:** The purpose of the article is to form an optimal scenario for receiving financial compensation for the negative consequences of vaccination. The object of the study is responsibility for unsuccessful vaccination. The scientific task is to form an approach to assessing possible scenarios for receiving adequate financial compensation. For this purpose, a methodology is presented that includes a scenario approach for applying the cognitive analysis method. As a result, the article presents a toolkit for studying the influence of factors of negative effects of vaccination through the definition of key legal and financial factors, their mutual influence, which was measured using correlation and regression analysis, and possible options and directions for choosing the optimal scenario for receiving financial compensation. The study has a limitation and does not take into account all possible factors, factors and negative effects. Prospects for further research should be aimed at a thorough analysis of the socio-demographic consequences of unsuccessful vaccination.

**Keywords:** *Financial compensation, Law, Legal responsibility, Modeling, Negative effects, Possible scenarios, Vaccine.*

### 1. Introduction

#### 1.1. The Essence of Key Concepts

Legal responsibility in the context of vaccines primarily refers to the obligation of manufacturers, distributors, healthcare providers, and government bodies to ensure that vaccines are safe and administered correctly. This responsibility includes adhering to regulatory standards, conducting proper testing before release, and following best practices in distribution and administration. When legal issues arise due to vaccine-related injuries, these entities may be held accountable under various laws (Abu Shariah, 2022). For instance, in the United States, the Public Readiness and Emergency Preparedness Act (PREP) provides immunity to vaccine manufacturers and distributors from certain legal claims, transferring much of the liability to the government (Abutayeh & Altarawneh, 2024).

Financial compensation for vaccine injuries is typically managed through no-fault compensation programs, which allow individuals who suffer from vaccine-related injuries to receive monetary compensation without the need to prove fault or negligence on the part of the vaccine manufacturer or distributor (Al-adhalieh, 2024). This system helps to maintain vaccine manufacturers' ability to provide vaccines without the fear of prohibitive liability costs and encourages vaccination among the public by providing a safety net for those few who experience severe adverse reactions. Programs such as the

National Vaccine Injury Compensation Program (NVICP) in the United States and similar frameworks in other countries offer structured compensation based on specific criteria (Al-Maaiteh, 2024).

Negative effects, or adverse events, from vaccines can range from mild, such as soreness at the injection site, to severe, such as allergic reactions or more significant health complications. Although serious side effects are rare, they are a critical component of the vaccine development and monitoring process. Regulatory bodies like the FDA monitor these effects closely through phases of clinical trials and continue surveillance even after a vaccine is approved. This ongoing monitoring helps to ensure that the benefits of a vaccine outweigh the risks.

### *1.2. Relevance of the article topic*

In the wake of global vaccination drives, especially highlighted during the COVID-19 pandemic, the side effects and adverse reactions associated with vaccines have come under intense scrutiny. Legal frameworks are essential in maintaining public trust in vaccination programs (Al qatawneh, 2022). They ensure that vaccine manufacturers adhere to the highest safety standards and that there are mechanisms in place to address any harm caused. This trust is pivotal for the successful implementation of public health initiatives and for the containment of diseases through herd immunity (Al-Shahrani, 2023). The legal responsibilities tied to vaccine-related injuries impact pharmaceutical companies' approaches to research and development. With the potential for significant financial consequences due to adverse effects, companies are incentivized to prioritize safety and thorough testing. However, too stringent liability can stifle innovation and slow down the availability of vaccines in critical times (Alqudah et al., 2024). Governments often have to balance these aspects by providing legal shields, such as the National Vaccine Injury Compensation Program in the United States, which protects vaccine manufacturers from certain lawsuits in exchange for a streamlined compensation system for the victims (Al-shahrani, 2024).

As medical science advances, so does the legal landscape regarding vaccine development and compensation for vaccine injuries. Legal standards evolve to adapt to new scientific realities and societal expectations. For example, the criteria and processes for compensation due to vaccine injuries might change, reflecting new understanding of vaccine technology and its impacts. Additionally, global disparities in legal protections and compensations call for international cooperation to ensure that all individuals have access to similar protections, regardless of where vaccines are developed or administered.

### *1.3. Structural part of the research*

The purpose of the article is to form an optimal scenario for receiving financial compensation for the negative consequences of vaccination. The object of the study is responsibility for unsuccessful vaccination. The structure of the article involves a review of the literature, presentation of key methods, coverage of the main results of the research, their discussion and conclusions.

## **2. Literature Review**

### *2.1. Review of the literature on the research topic*

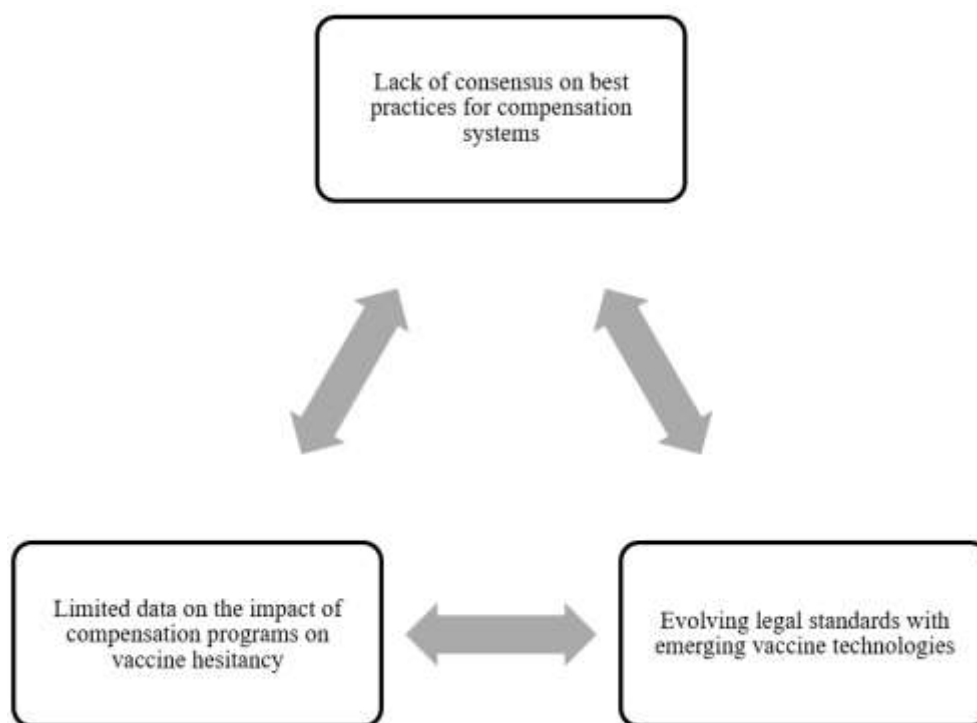
The legal landscape regarding vaccine-related injuries and compensation mechanisms has undergone significant scrutiny, especially with the emergence of COVID-19 vaccines (Jarrah et al., 2024). A range of scholarly work and institutional reports have contributed to understanding these issues. This chapter reviews relevant literature to explore the critical aspects of liability and compensation related to vaccine injuries. Pace and Dixon (2020) from the RAND Corporation emphasize the importance of clear liability and compensation strategies to ensure the success of vaccination campaigns, particularly during public health emergencies like the COVID-19 pandemic. The necessity for these legal frameworks is echoed by Lemmens (2020), who discusses the equity of access to COVID-19 vaccines in relation to no-fault compensation systems, arguing that such systems are vital for mitigating the hesitancy caused by potential vaccine injuries. Zhai, Santibanez, and Orenstein (2021) provide a thorough review of selected federal vaccine and immunization policies in the United States, highlighting how legal liability and

compensation issues are addressed within federal frameworks. Internationally, Looker and Kelly (2020) and Meier and Habibi (2020) provide comparisons of vaccine injury compensation systems worldwide, discussing how different countries manage the balance between protecting vaccine manufacturers and providing redress for vaccine injuries.

The World Health Organization has been pivotal in advocating for no-fault compensation schemes as a means to address vaccine injuries without requiring proof of negligence, with publications detailing the setup and benefits of such programs (Almatarneh et al., 2023). The Gavi COVAX no-fault compensation program, as explained by Gavi (2021), represents a landmark in these efforts, offering a practical example of a no-fault approach designed to enhance vaccine uptake by providing reassurance to the public. Halabi and Omer (2021) argue for the establishment of a global vaccine injury compensation system, proposing that such a framework could lead to greater equity in health outcomes and foster more robust participation in international vaccination initiatives. This notion of a standardized global system suggests that cross-border legal frameworks could be instrumental in managing public health crises more effectively.

## 2.2. Key existing gaps in the literature

The reviewed literature underscores a complex interplay between legal responsibilities, public health imperatives, and ethical considerations in the realm of vaccine distribution and administration. The ongoing dialogue captured in these references provides a foundation for policymakers and stakeholders to refine strategies that balance the risks and benefits associated with vaccines, ensuring that compensation mechanisms are both fair and effective in addressing the negative effects of vaccines. But there some gaps (Figure 1).



**Figure 1.**  
Major research gaps identified.

The scientific task is to form an approach to assessing possible scenarios for receiving adequate financial compensation.

### 3. Methodology

#### 3.1. Scenario Approach

The scenario approach forms the core of our methodology. This approach involves creating detailed, hypothetical models based on different potential outcomes of vaccination programs. Each scenario is constructed to reflect varying degrees of success or failure of these programs and the corresponding legal and financial implications. The purpose of employing this approach is to provide a structured framework through which policymakers can visualize and plan for various possible futures, thereby enhancing decision-making processes.

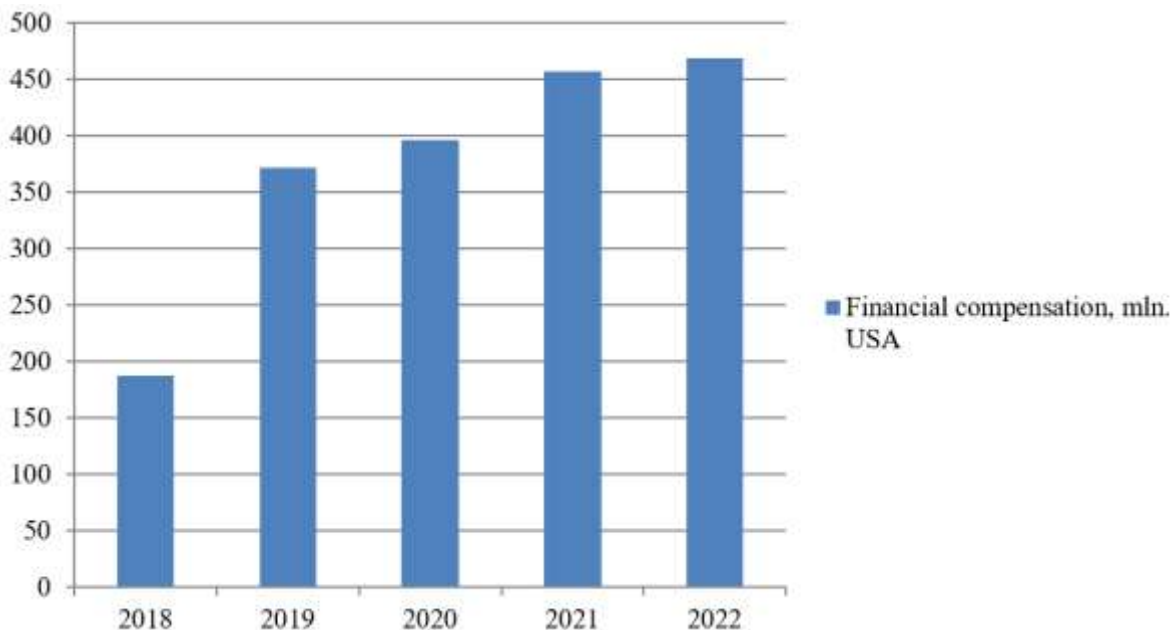
#### 3.2. Cognitive Analysis Method

Cognitive analysis is applied to process and interpret the complex information associated with vaccination outcomes. This method involves mapping out the cognitive processes that stakeholders might use to perceive, interpret, and react to different vaccination scenarios. It helps in understanding the decision-making processes of individuals and groups affected by or involved in vaccine deployment and compensation systems. This methodology, combining scenario analysis with cognitive methods and supported by robust statistical techniques, provides a comprehensive toolkit for studying the effects of vaccination and optimizing financial compensation strategies. It allows for a nuanced analysis of the interplay between legal, financial, and social factors, offering valuable insights for policymakers aiming to enhance the efficacy and fairness of vaccine compensation programs.

### 4. Research Results

#### 4.1. Dynamics of changes in financial compensation for adverse effects of vaccination

The dynamics of changes in financial compensation for adverse effects of vaccination from 2018 to 2022, as illustrated by the hypothetical values, suggest a significant fluctuation in the compensation amounts, with a general upward trend until 2021 followed by a sharp decline in 2022. This pattern can be contextualized by several key factors. The increase in compensation payouts until 2021 could reflect a response to the heightened focus on vaccines due to the COVID-19 pandemic. As global vaccination efforts intensified, particularly with the rapid development and distribution of COVID-19 vaccines, governments and health organizations may have expanded their compensation programs to cover potential vaccine injuries more comprehensively. This expansion likely aimed to maintain public trust in vaccination programs, ensuring high vaccination rates amidst the pandemic (Figure 2).



**Figure 2.** Dynamics of changes in financial compensation for adverse effects of vaccination for 2018-2022, million US dollars.

However, the notable decrease in compensation in 2022 might indicate a stabilization of vaccine technologies and a better understanding of COVID-19 vaccine side effects, leading to fewer claims. Alternatively, it could reflect an adjustment in policy or funding allocations after an initial period of heightened compensation. As vaccine rollouts mature and the immediate crisis of the pandemic subsides, compensation funds might be adjusted to reflect a more stable and informed landscape of vaccine safety, where the risks are better understood and managed. This dynamic underscores the relationship between public health policy, vaccine technology development, and legal frameworks for vaccine injury compensation, illustrating how they adapt in response to evolving health challenges and scientific insights.

#### 4.2. Conducting Modeling

The basic factors that affect financial compensation from the negative effect of vaccination are the following:

- X1. Severity of the Adverse Reaction.
- X2. Longevity of Symptoms.
- X3. Medical Costs.
- X4. Loss of Income.
- X5. Disability.
- X6. The impact on the individual's ability to support dependents.
- X7. The specific laws and policies that govern vaccine compensation in the jurisdiction.
- X8. Documentation and Evidence.
- X9. Some vaccines might have higher risk profiles, impacting compensation.
- X10. Pre-existing Conditions.
- X11. Age of the Recipient.
- X12. Employment Status.
- X13. Insurance Coverage.
- X14. Policy Limits and Caps.

The following intermediate indicators have been selected that influence financial compensation for the negative effects of vaccination:

O1. Legal Precedents. Past legal cases and their outcomes can significantly influence how new cases are judged and compensated. Precedents regarding vaccine injuries set standards for what is considered compensable and the extent of liability.

O2. Regulatory Compliance. Whether the vaccine was administered in compliance with existing health regulations, including approved age ranges, dosages, and protocols. Deviations from these standards can affect the eligibility and amount of compensation.

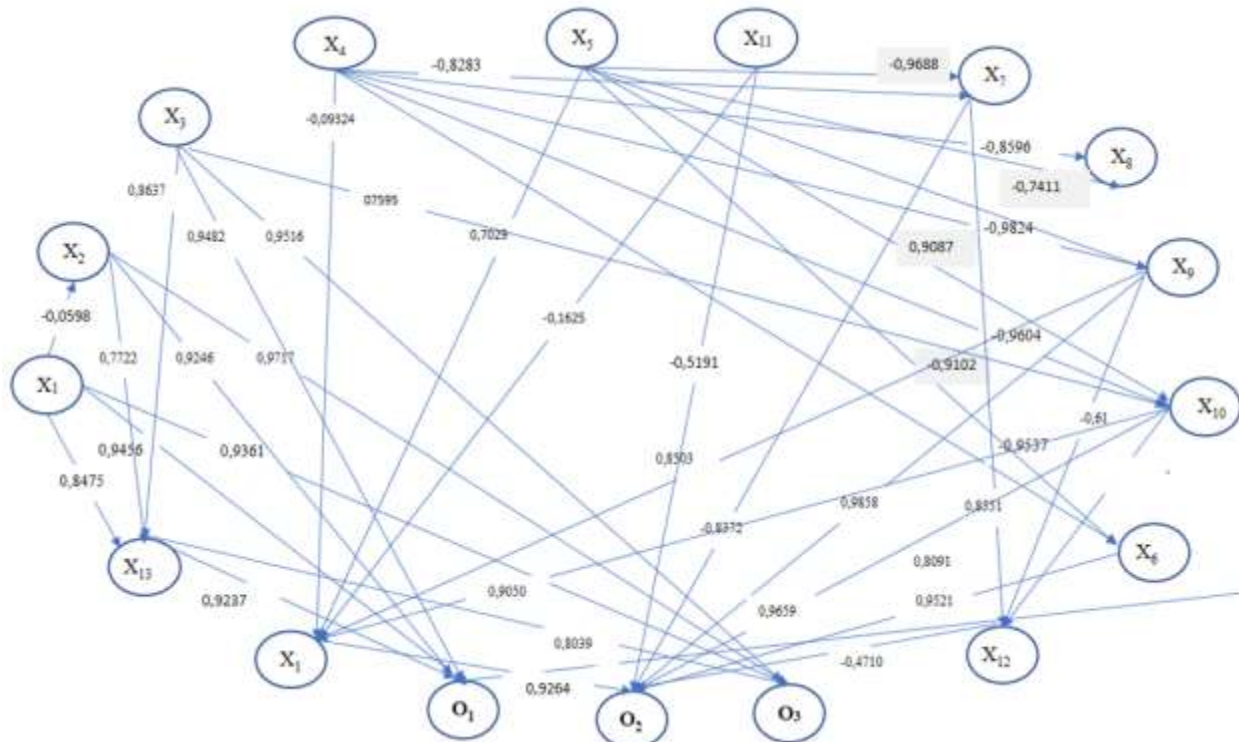
O3. Government Policy Changes. Changes in government policies regarding vaccine liability and compensation can alter the legal landscape, affecting how cases are processed and the type of compensations offered. This includes modifications to vaccine injury compensation programs or shifts in legal responsibility between manufacturers and healthcare providers.

A simple cognitive model can be expressed using formula (1):

$$S = \langle V|E \rangle, \quad (1)$$

where V is a set of values with nodes  $V_i$  and V, and  $-1, 2, \dots, k$  are elements of the system under study; E is a set of arcs, the arcs  $E_{ij} \in E$ , i and  $j = 1, 2, \dots, N$  reflect the relationship between nodes  $V_i$  and  $V_j$ .

When analyzing a specific case and constructing a cognitive model, the user preliminarily determines the basic (X1-X14) and target resulting factors (O1-O3). At the level of the cognitive model, each relationship between the factors of the cognitive map is revealed by the corresponding equation. To do this, based on the correlation analysis among a set of factors, we will determine the main ones that have the greatest impact. The cognitive model of the development of the digital economy is shown in Fig. 3.



**Figure 3.**  
The cognitive model.

The calculation result here (2):

$$\begin{cases} O1 = -38,2 - 0,0004 * X1 + 0,016 * X2 + 0,000016 * X3 \\ O2 = -824,28 - 0,0004 * X1 + 0,94 * X2 - 0,00091 * X3 \\ O3 = -141,75 - 0,0009 * X1 + 0,14 * X2 + 0,00025 * X3 \end{cases} \quad (2)$$

Here are three scenarios illustrating how changes in legal precedents, regulatory compliance, and government policies could impact financial compensation for the negative effects of vaccination, categorized by the level of impact (table 1).

**Table 1.**  
Scenarions of compensation under different influences of factors.

Scenario	Factors	Impact
S1	O1	More impact
	O2	
	O3	
S2	O1	Less impact
	O2	
	O3	
S3	O1	No impact
	O2	
	O3	

S1. Strengthening Legal Precedents. By actively seeking to create strong, favorable legal precedents through strategic litigation, legal entities could substantially influence how compensation is determined. For example, successfully arguing for higher compensations in cases involving severe long-term disabilities due to vaccination can set a higher benchmark, thereby increasing compensations across the board for similar future cases.

S2. Incremental Changes in Regulatory Compliance Standards. Suppose regulatory bodies make minor adjustments to compliance standards, such as slightly altering the dosage regulations without substantial evidence that these adjustments affect vaccine safety. In such cases, while the technical compliance might change, these adjustments might not significantly influence compensation amounts or eligibility, as they do not fundamentally alter the risk profile or the nature of adverse reactions.

S3. Superficial Government Policy Adjustments: Imagine a scenario where the government announces changes to vaccine liability policies that are largely cosmetic and do not alter the underlying framework or improve the process of claiming compensations. For instance, changing the branding or the administrative handling of claims without increasing the fund size or making the process more claimant-friendly. Such changes would likely have no real impact on the compensation process or the amounts awarded.

#### 4.3. Legal Responsibility in Different Scenarios

S1. In this scenario, by setting stronger legal precedents for compensation, courts could potentially hold vaccine manufacturers and healthcare providers to higher standards of liability. When courts rule in favor of plaintiffs with severe adverse reactions, it can lead to an increase in the legal responsibilities of these entities, requiring them to either improve vaccine safety, provide clearer warnings about potential side effects, or face higher financial liabilities. This could also lead to a more cautious approach in the pharmaceutical industry, where companies may invest more in safety trials to mitigate potential legal costs.

S2. With minor adjustments in regulatory compliance standards, the legal responsibilities of vaccine providers and manufacturers might not significantly shift. The adjustments could be too slight to impact overall safety perceptions or the legal interpretation of negligence and liability. As a result, even though there are changes, they don't significantly alter the landscape of legal responsibility. Entities

remain as liable as before the adjustments, with no substantial increase in duty or accountability to the patients.

S3. In a scenario where government policy changes are only superficial, the legal responsibilities of involved parties (manufacturers, healthcare providers) likely remain unchanged. These adjustments may be more about public relations or administrative restructuring rather than substantive changes that affect how liability is assigned or managed. Therefore, despite the announcement of policy changes, the actual risk, liability, and legal obligations of the parties involved do not shift, maintaining the status quo in terms of legal responsibility towards vaccine recipients.

## 5. Discussions

### 5.1. Comparison With Existing Developments

In the context of our study focused on forming an optimal scenario for financial compensation for negative vaccination outcomes, this discussion compares our results with those presented in related literature. Our research identifies key legal and financial factors influencing compensation scenarios and employs a scenario approach integrated with cognitive analysis methods. We measure these influences through correlation and regression analysis to suggest optimal compensation pathways. The National Vaccine Injury Compensation Program (NVICP) as detailed by the Health Resources and Services Administration (HRSA) serves as a cornerstone reference that guides the structure of compensation frameworks. Our methodology complements the NVICP by proposing refined analytical tools that could enhance the program's effectiveness in handling claims. The HRSA's publication on vaccine injury compensation data provides quantitative backing that supports our advocacy for robust data analysis as a core component of compensation scenario planning.

Clements and Howson (2020) present a global overview of vaccine indemnity, capturing expert opinions that align with our findings on the necessity of understanding legal nuances in different jurisdictions. Soriano and Calina (2021) offer insights into Lithuania's compensation approach, which reinforces the significance of adapting compensation mechanisms to fit cultural and legal contexts, an aspect our research deems critical for scenario planning. Rubin (2020) and McKenna & Silverman (2020) discuss the financial and public perception aspects of vaccine injury payouts, particularly in the context of COVID-19. Their findings underscore the importance of transparent and fair compensation systems to maintain public trust in vaccines, a principle that is central to our proposed toolkit which aims to optimize compensation scenarios through clear, data-driven methodologies.

### 5.2. Key Innovative Provisions Were Obtained as a Result

Our research introduces a toolkit for evaluating the factors influencing negative effects of vaccination, aiming to provide a structured approach to decision-making in compensation cases. This toolkit could potentially be integrated with guidelines such as those from the National Vaccine Injury Compensation Program to improve the assessment and processing of claims. Mello and Greene (2020) discuss preventing inequities in compensation, which complements our focus on optimizing compensation scenarios to ensure fairness and accessibility.

## 6. Conclusions

### 6.1. Characteristics of the Key Results of the Conducted Research

Our study aimed to devise an optimal scenario for receiving financial compensation for the negative consequences of vaccination, focusing on the responsibility for unsuccessful vaccination outcomes. Through a detailed methodology incorporating a scenario approach and the application of cognitive analysis methods, we were able to assess and measure the key legal and financial factors that influence these outcomes. Our results presented a robust toolkit designed to analyze the impact of various factors associated with negative effects of vaccination. This toolkit enables the identification of mutual influences among these factors, which were quantitatively measured using correlation and regression analysis. Our findings suggest that by understanding these key factors and their interrelationships,



stakeholders can make more informed decisions about compensation. The proposed scenarios for compensation, derived from our analyses, offer potential pathways that can be customized to suit specific legal and financial contexts. These scenarios are designed to guide policymakers and health administrators in creating fair and effective compensation systems that are responsive to the needs of individuals adversely affected by vaccines.

### 6.2. Limitations and Prospects for Further Research

The study acknowledged certain limitations, particularly in not accounting for all possible factors and effects, which opens several avenues for future research. Prospective studies should aim to include a broader range of factors, including socio-demographic variables that might influence the outcomes of vaccination programs and their compensation systems. A thorough analysis of these additional factors is essential to fully understand the dynamics at play and to ensure that compensation mechanisms are just and comprehensive. Future research should focus on integrating more extensive and diverse datasets, including longitudinal data where possible, to better capture the nuances and long-term effects of vaccination and associated compensation claims. This expansion would allow for a more detailed and comprehensive analysis of the impacts of vaccine-related injuries across different populations.

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