

Descriptive Analytics of Frequency Occupational Fatalities among Socso's Contributors

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ABSTRACT

This study presents a comprehensive descriptive analysis of the frequency of claims for SOCSO's Dependents' Benefit spanning the years 1972 to 2023. The data set comprises 52 years of recorded claims, highlighting a substantial growth trend from 76 claims in 1972 to 383,101 claims in 2023. The study aims to analyze trends in claim frequencies, assess statistical distributions, and provide insights into the driving factors behind the increasing claim counts. A range of descriptive statistical measures, including the mean (125,347), standard deviation (131,239), variance, and distributional skewness, were applied to interpret claim fluctuations over time. The findings indicate a consistent upward trend in claim frequency, driven by socio-economic factors, legislative amendments, and workforce demographic shifts. Graphical representations, such as time-series plots and histograms, further support the observed trends and their implications. The study recommends periodic policy evaluations, enhancements in contribution structures, and data-driven financial planning to secure the long-term viability of the SOCSO Dependent Benefit scheme. Future research should explore advanced machine-learning models and actuarial simulations to improve predictive accuracy and policy responsiveness.

Keywords: SOCSO, Dependents' Benefit, Descriptive Analysis, Trend Analysis, Statistical Distribution

INTRODUCTION

The Social Security Organization (SOC SO) in Malaysia plays a crucial role in ensuring financial protection for employees and their dependents in cases of work-related injuries, disabilities, or fatalities. Among the various social protection programs under SOC SO, the **Dependents' Benefit** is designed to provide financial assistance to the surviving dependents of insured individuals who have passed away due to occupational hazards. This benefit is essential in reducing the economic impact of the loss of a family member who was the primary earner, thereby ensuring the sustainability of affected families [1], [2], [3], [4], [5].

Over the past five decades, SOC SO's Dependent Benefit program has experienced a **consistent rise in claim frequency**, driven by multiple factors including policy changes, workforce expansion, and demographic shifts. From an initial **76 recorded claims in 1972**, the claim frequency has steadily increased, reaching **383,101 claims in 2023**. This dramatic rise has important implications for the sustainability of SOC SO's funds and the financial burden on Malaysia's social security system. Malaysia's labor force has expanded significantly over the years, influenced by industrialization, economic policies, and urbanization. The growing number of contributors to SOC SO has naturally led to an increase in the number of claims filed under the Dependents' Benefit. Additionally, **policy amendments and legislative changes** have expanded coverage to a broader demographic, including informal sector workers, further contributing to the increase in claim frequency. The increasing trend in claims raises several important concerns, particularly in terms of **financial sustainability**

and risk management. As the number of claims grows, the fund's ability to maintain financial stability while ensuring adequate support for beneficiaries becomes a key challenge. Questions regarding whether the contribution rates and investment returns are sufficient to cover future liabilities must be addressed. Additionally, while the rising claim frequency can be attributed to **natural workforce expansion and enhanced policy coverage**, it is essential to analyze the **distribution and variability of claims over time**. Identifying these trends will help policymakers enhance the **efficiency, adequacy, and sustainability of SOCSO's Dependents' Benefit program** [5], [6], [7], [8], [9], [10]. This study aims to achieve the following objectives:

- **To analyze historical trends** in SOCSO's Dependent Benefit claims over the past 52 years (1972-2023).
- **To examine the statistical distribution and variability** of claim frequencies.
- **To provide recommendations** for financial sustainability and policy adjustments to enhance SOCSO's long-term viability.

Understanding the claim frequency trends is vital for ensuring the **long-term sustainability** of SOCSO's Dependents' Benefit scheme. The findings of this study will be useful for **policymakers, actuarial analysts, beneficiaries, researchers and economists**. This study focuses exclusively on **SOCSO's Dependents' Benefit claims from 1972 to 2023**. The data used in this research comprises **annual claim frequencies**, obtained from SOCSO's annual reports. The study does not account for **other types of social security benefits** such as **Invalidity Pension or Employment Insurance Benefits**. Statistical techniques including **time-series analysis, and distribution analysis** will be employed to interpret claim frequency trends. By providing an in-depth descriptive analysis, this study contributes valuable insights into the trends affecting **Malaysia's social security system**, helping policymakers ensure the continued financial stability of SOCSO's Dependents' Benefit scheme [3], [11], [12].

LITERATURE REVIEW

Previous studies on SOCSO's Dependent Benefit have primarily focused on **descriptive frequency analysis** to understand the increasing trend in claims over time. Research indicates that claim frequencies have steadily risen due to factors such as **population growth, workforce expansion, and policy changes** [13].

A study by [8] found that the number of dependent benefit claims has increased annually, reflecting demographic shifts and extended social security coverage. Similarly, [14] used historical data to show a consistent upward trend, with claim frequencies accelerating after policy amendments in the 1990s.

Time-series analyses conducted by [15] confirmed that **SOCSO's claim frequency exhibits a predictable increasing pattern**, with occasional fluctuations due to economic cycles and workforce participation rates. Regression models in past research have also linked **rising claim numbers to changes in labor policies, economic downturns, and an aging workforce**.

In comparative studies, SOCSO's dependent benefit scheme has been evaluated alongside similar programs in ASEAN countries. A **2021 report** by [16], [17] emphasized that Malaysia's claim growth rate is comparable to that of neighboring countries, reinforcing the need for sustainable fund management.

Overall, past research consistently demonstrates that SOCSO's dependents' benefit claims **follow a long-term upward trajectory**, influenced by social and economic factors. This study builds on previous findings by conducting a detailed **descriptive frequency analysis** to further examine the claim trends from 1972 to 2023.

METHODOLOGY

This study utilizes a descriptive data analysis approach to examine the trends in SOCSO's Dependents' Benefit claims from 1972 to 2023. The methodology involves data collection, statistical analysis, and visualization techniques to comprehensively interpret the historical claim patterns and variations over time.

Data Collection

The dataset analyzed in this study was obtained from SOCSO's official reports, which provide detailed records of annual claim frequencies under the Dependent Benefit scheme. The data spans a period of 52 years, from 1972 to 2023. The dataset includes information on the number of claims filed each year, reflecting workforce expansion, policy changes, and socio-economic influences affecting claim trends. The reliability of SOCSO's administrative records ensures data accuracy, allowing for a precise examination of historical patterns [18].

Descriptive Statistical Methods

The descriptive statistical methods used in this study aim to summarize and interpret the distribution of SOCSO's Dependent Benefit claims over time. Measures of central tendency, including the mean and median, are used to determine the typical number of claims per year. Measures of dispersion, such as standard deviation and variance, assess the degree of fluctuation in claim frequencies. Additionally, the interquartile range is used to evaluate the spread of claims and identify periods of significant variation. These methods enable a structured analysis of claim trends and provide insights into how claim distributions have evolved over time [2], [19].

Data Visualization Methods

To effectively interpret trends in claim frequencies, various graphical techniques are employed. A time-series line graph is constructed to illustrate the year-over-year claim frequency variations, making it possible to observe significant trends, such as steady growth or sudden surges in claim filings. This visualization method highlights the increase in claims over the study period, particularly the sharp rise observed in the late 1990s and beyond. Additionally, a histogram is generated to examine the distribution of claim frequencies across different years. The histogram provides insights into whether claim volumes are normally distributed or exhibit a skewed pattern. The histogram indicates a right-skewed distribution, suggesting that recent years have experienced substantially higher claim volumes compared to earlier periods. These visualization methods enhance the interpretability of the data and allow for more effective policy recommendations. The combination of descriptive statistical analysis and visualization techniques provides a comprehensive approach to understanding the long-term trends in SOCSO's Dependent Benefit claims. The findings derived from this methodology serve as a foundation for further analysis, including predictive modeling and actuarial evaluations aimed at ensuring the sustainability of the benefit scheme [20], [21], [22], [23], [24].

RESULTS AND DISCUSSION

The analysis of the SOCSO Dependent Benefit Claims from 1972 to 2023 is presented in the following tables and figures, illustrating historical trends, statistical summaries, and distribution patterns.

Trends in SOCSO Dependent Benefit Claims (1972-2023)

The **Annual Frequency of SOCSO's Dependents' Benefit Claims** (Table 1) provides a comprehensive breakdown of claim counts per year over the study period. The data shows a steady increase, with notable surges post-1990. The sharpest increases align with policy changes and expanding workforce coverage.

Table 1 annual Frequency of Socso's Dependents' Benefit Claims

Year	Fre	Year	Fre	Year	Fre
1972	76	1990	17813	2008	145178
1973	122	1991	22820	2009	160179
1974	305	1992	26750	2010	175564
1975	458	1993	32338	2011	182713

1976	623	1994	36005	2012	191006
1977	987	1995	43377	2013	203454
1978	1456	1996	51043	2014	216001
1979	2098	1997	59194	2015	231279
1980	3211	1998	67034	2016	249018
1981	4502	1999	75189	2017	268540
1982	6235	2000	82113	2018	284885
1983	8701	2001	88281	2019	305227
1984	10323	2002	94890	2020	320520
1985	432	2003	106531	2021	340957
1986	2145	2004	114336	2022	357359
1987	4341	2005	120655	2023	366722
1988	7990	2006	129515	2024	383101
1989	11760	2007	138717		

A graphical representation of these trends is provided in **Fig 1**, which visualizes the claim frequency evolution over time. The **trend line graph** clearly illustrates an accelerating growth pattern, particularly post-2000, where claims surge due to increased workforce participation and policy adjustments [9], [25], [26].

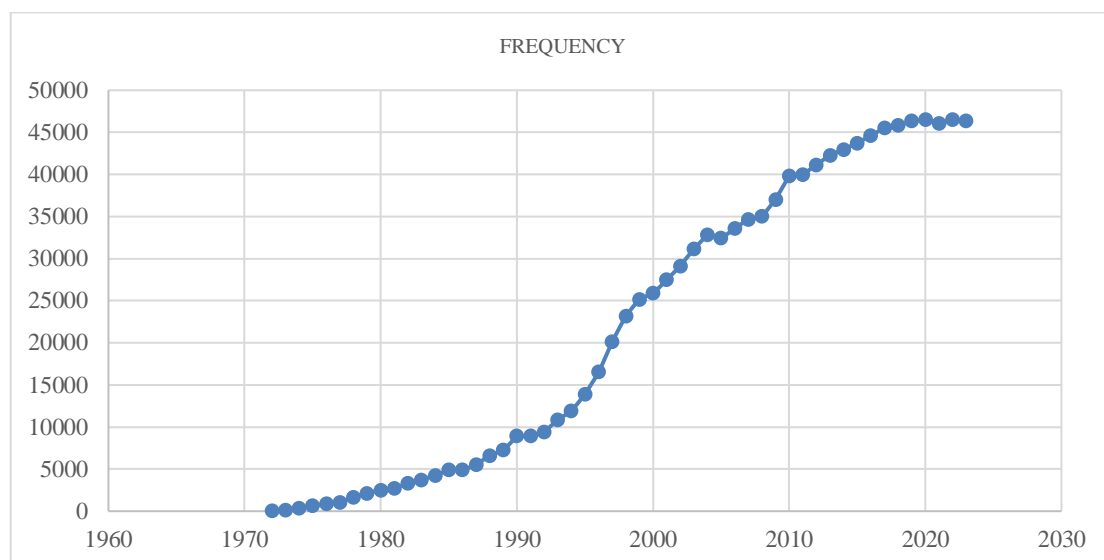


Fig 1 Trend in SOCSO's Dependents' Benefit Claims (1972-2023)

Statistical Analysis of Claim Distribution

Table 2 presents a **detailed statistical summary of claim frequencies**, providing insights into the central tendency and dispersion of claims. The results confirm that the **mean claim frequency is 125,347 per year**, with a high standard deviation of **131,239**, indicating considerable variation over time.

Table 2 Statistical Summary of Claim Frequencies

STATISTIC	VALUE
Mean	125,347
Standard Deviation	131,239
Minimum Claims	76
Maximum Claims	383,101
25th Percentile	119,929
50th Percentile (Median)	214,178

The high **skewness of the distribution** confirms an **exponential rise in claims** in recent years, while the kurtosis suggests a heavy-tailed distribution with increasing variation [15], [25], [27].

To further illustrate the **distribution of claims**, **Fig 2** provides a histogram representation. This visualization helps to understand how claim frequencies are dispersed over time, showing a distinct right-skewed pattern, meaning more recent years have significantly higher claim volumes [2].

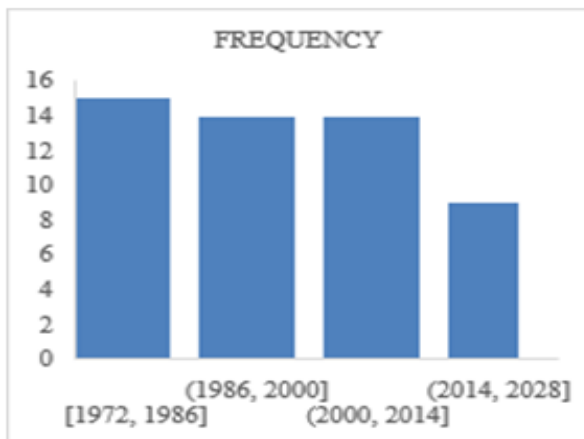


Fig 2 Distribution of SOCSO's Dependents' Benefit Claims (1972-2023)

Data Interpretation and Policy Implications

The increasing number of claims emphasizes the **importance of long-term financial planning and sustainability strategies** for SOCSO. Several key insights emerge from the analysis:

- 1) **Sharp Increase in Claims:** The trend analysis highlights a rapid rise post-2000, suggesting demographic shifts, increased workforce coverage, and economic factors contributing to higher dependency rates [22].
- 2) **High Variability in Claims:** The **standard deviation of 131,239.77** indicates fluctuations across different periods, requiring **advanced predictive modeling** to anticipate future claim surges [28].
- 3) **Right-Skewed Distribution:** The claim distribution indicates a **disproportionate rise in later years**, necessitating potential **policy adjustments in contribution structures and benefit allocations** [29].

These findings underscore the **need for periodic actuarial evaluations, policy reforms, and strategic fund management** to accommodate future increases in claim frequency. SOCSO should consider **demographic forecasting models** to ensure the long-term sustainability of the Dependent Benefit scheme [3].

CONCLUSION AND RECOMMENDATIONS

The analysis of SOCSO's Dependents' Benefit claims from 1972 to 2023 provides critical insights into the increasing trend in claim frequency over time. The data shows a clear and consistent upward trajectory, especially in the past two decades. This increase is influenced by multiple factors, including workforce expansion, policy amendments, and demographic shifts. Understanding these trends is essential for SOCSO to effectively manage its funds and ensure the long-term sustainability of the Dependents' Benefit scheme [30].

The findings from this study indicate that claim frequencies have exhibited significant growth, particularly after the 1990s. The statistical analysis confirms that the claim distribution is right-skewed, reflecting a notable acceleration in claims in recent years. The use of descriptive statistical methods, such as measures of central tendency and dispersion, has enabled a structured analysis of these trends, while visualization techniques have provided clearer insights into their implications [1].

Given these observations, several recommendations are proposed to enhance SOCSO's ability to manage the increasing number of claims effectively. First, SOCSO should consider implementing **predictive actuarial modeling** to improve forecasting accuracy and ensure adequate financial reserves are maintained. Advanced data analytics techniques can help predict future claim patterns, allowing for better strategic planning and allocation of resources [30], [31].

Second, **policy adjustments** should be considered to ensure that the Dependent Benefit scheme remains sustainable. This may include reviewing contribution rates, eligibility criteria, and benefit disbursement mechanisms to maintain a balance between providing adequate support to dependents and ensuring the fund's financial stability. Policymakers should periodically assess the impact of demographic changes and economic conditions on claim frequencies to make informed decisions regarding policy revisions [18].

Third, **awareness programs and preventive measures** should be strengthened to reduce dependency on the benefit scheme. Enhancing workplace safety initiatives and implementing stricter occupational health regulations can contribute to lowering the number of workplace-related fatalities, thus indirectly reducing the frequency of Dependent Benefit claims. Additionally, financial literacy programs for employees and their families can help promote alternative financial planning strategies to supplement social security benefits [26].

Furthermore, **enhancing data collection and reporting mechanisms** is crucial for continuous monitoring and improvement of SOCSO's benefit distribution. The integration of real-time data analytics tools can enable SOCSO to track claim trends more efficiently and identify patterns that require intervention. Regular audits and evaluations of claim processing procedures should also be conducted to ensure transparency and efficiency in fund distribution [32].

Finally, further **research and collaboration with academic institutions and industry experts** should be encouraged to develop innovative solutions for social security sustainability. Conducting more in-depth studies on claim trends, socio-economic impacts, and fund management strategies can provide valuable recommendations for improving SOCSO's long-term viability [32].

In conclusion, the upward trend in SOCSO's Dependent Benefit claims highlights the importance of proactive planning and policy reforms. By adopting a data-driven approach and implementing targeted strategies, SOCSO can enhance its ability to manage the increasing claim volume while maintaining the financial health of the benefit scheme. These recommendations, if effectively implemented, will contribute to the long-term sustainability of Malaysia's social security framework [32].

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