

SPATIO-TEMPORAL ANALYSIS OF SHIFTS IN THE COMPOSITION OF FACTORS CAUSING DIVORCE CASES IN SULAWESI, INDONESIA

¹Nur Hikmah Auliana, ²Muspita Sari, ³Arham Nur Alim

e-mail: nurhikmahauliana@iain-bone.ac.id

e-mail: muspita.sari@iain-bone.ac.id

e-mail: arhamnuralim429@gmail.com

^{1,2}Institut Agama Islam Negeri Bone

³Universitas Muhammadiyah Bone

ABSTRACT

Changes in the composition of divorce causes are important to understand because they reflect evolving social dynamics. However, previous studies have mainly focused on the number of divorce cases or dominant causes, while changes in the composition of divorce causes over time and across regions remain underexplored. This study analyzes spatio-temporal changes in the composition of divorce causes across Sulawesi, Indonesia, during 2023–2025. A descriptive quantitative approach was employed using secondary data from the Indonesian Central Statistics Agency on divorce cases by province and their causes. The analysis combined composition percentages, proportion changes, and Total Variation Distance (TVD). Results showed that continuous disputes and quarrels were the leading cause of divorce in all provinces throughout the study period. Proportion change analysis indicated that this factor generally increased, whereas economic problems, domestic violence, and abandonment by one party tended to decline in several provinces. TVD analysis revealed spatial variation in compositional shifts. West Sulawesi experienced the largest changes (TVD = 0.1611 for 2024–2025; TVD = 0.1345 for 2023–2025), whereas Southeast Sulawesi showed the lowest TVD (0.0134), indicating the most stable composition of divorce causes.

Keywords: Divorce cases, Causes of divorce, Proportional changes, Total Variation Distance, spatiotemporal analysis.

INTRODUCTION

Divorce is a social phenomenon that not only marks the end of a marital bond but also reflects the dynamics of social, economic, and cultural conditions, as well as interpersonal relationships within society. Essentially, divorce is a legal process to dissolve the marital bond between a husband and wife for specific reasons when the marriage can no longer be sustained or has reached a point of no return (dissolution of marriage)¹. Divorce is viewed as a failure of the husband and wife to adapt to one another

in resolving various domestic issues, resulting in conflicts that can no longer be resolved constructively². Various studies indicate that divorce is influenced by a variety of interacting factors; therefore,

¹ Nibras Syafriani Manna, Shinta Doriza, and Maya Oktaviani, 'Cerai Gugat: Telaah Penyebab Perceraian Pada Keluarga Di Indonesia', *JURNAL AL-AZHAR INDONESIA SERI HUMANIORA*, 6.1 (2021), 11, <https://doi.org/10.36722/sh.v6i1.443>.

² Nida Rafiqah Izzati, Robi'atin A'dawiyah, and Abdul Qodir Zaelani, 'Perceraian Dalam Perspektif Normatif-Yuridis Dan Psikologis', *Journal of Islamic and Law Studies*, 8.1 (2024), 62–81, <https://jurnal.uin-antasari.ac.id/index.php/jils/article/view/12853>.

understanding the causes of divorce is crucial as a foundation for developing more effective policies and programs to strengthen family resilience³. This complexity indicates that divorce cannot be viewed solely in terms of the number of cases occurring, but also in terms of changes in the characteristics of the underlying factors.

According to data from the Central Statistics Agency (BPS), during the 2023–2025 period, divorce cases in the six provinces of Sulawesi were predominantly driven by ongoing disputes and arguments. In South Sulawesi, for example, these factors accounted for 9.856 cases in 2023⁴, 9.297 cases in 2024⁵, and increased to 10.574 cases in 2025⁶. However, other factors—such as abandonment by one party, economic issues, domestic violence, alcohol abuse, gambling, and other causes—also contributed, though in varying proportions across each province. This situation indicates that it is not only the number of divorce cases that is important to consider, but also how the composition of the contributing factors changes across regions and over time.

Most research on divorce in Indonesia generally still focuses on identifying the factors that cause divorce^{7 8 9 10}, the development of classifications of dominant factors through systematic reviews¹¹, or the identification of the most dominant causal factors using machine learning approaches¹². Although these studies have provided an overview of the factors associated with divorce, research specifically analyzing shifts in the composition of causal factors in divorce cases across regions and over time remains very limited. However, such changes in composition may reflect distinct social dynamics across regions and time periods, making further examination crucial. Therefore, an analytical

³ Nanang Wartono and Akbarizan, 'Analisis Komparatif Faktor Penyebab Terjadinya Perceraian Di Negara-Negara Muslim', *MAQASID: Jurnal Studi Hukum Islam*, 14.3 (2025), 124–42, <https://doi.org/https://doi.org/10.30651/mqsd.v14i3.28617>.

⁴ Badan Pusat Statistik, 'Jumlah Perceraian Menurut Provinsi Dan Faktor, 2023', *Badan Pusat Statistik*, 2023.

⁵ Badan Pusat Statistik, 'Jumlah Perceraian Menurut Provinsi Dan Faktor Penyebab Perceraian (Perkara), 2024', *Badan Pusat Statistik*, 2024.

⁶ Badan Pusat Statistik, 'Jumlah Perceraian Menurut Provinsi Dan Faktor Penyebab Perceraian (Perkara), 2024-2025', *Badan Pusat Statistik*, 2025.

⁷ Bernhardt Siburian, 'Analisis Faktor-Faktor Penyebab Perceraian Berdasarkan Keputusan Pengadilan Negeri Balige Tahun 2017', *Jurnal Ilmiah Religiosity Entity Humanity (JIREH)*, 1.1 (2019), 31–39, <https://doi.org/10.37364/jireh.v1i1.5>.

⁸ Risa Nurhalisa, 'Tinjauan Literatur: Faktor Penyebab Dan Upaya Pencegahan Sistematis Terhadap Perceraian', *Media Gizi Kesmas*, 10.1 (2021), 157, <https://doi.org/10.20473/mgk.v10i1.2021.157-164>.

⁹ Nina Munawara, Muhammad Hasan, and Ardiansyah, 'FAKTOR-FAKTOR PENYEBAB PERCERAIAN PADA PERNIKAHAN DINI DI PENGADILAN AGAMA KELAS I-B SAMBAS', *AL-USROH*, 1.2 (2021), 107–31, <https://doi.org/https://doi.org/10.24260/al-usroh.v1i2.393>.

¹⁰ Jihaan Fauziyah Rahman and Fahmi Fatwa Rosyadi Satria Hamdan, 'Faktor-Faktor Penyebab Tingginya Angka Perceraian Di Kabupaten Purwakarta Tahun 2021-2023', *Jurnal Riset Hukum Keluarga Islam (JRHKI)*, 4.2 (2024), 97–104, <https://doi.org/https://doi.org/10.29313/jrhki.v4i2.5192>.

¹¹ Tubagus Fajar Setiadi, Lukman Aqil Prambudi, and Moody Putri Azzahra, 'Disintegrasi Rumah Tangga: Faktor Perceraian Dalam Tinjauan Sistematis Terhadap Krisis Perkawinan Kontemporer', *Marital: Jurnal Hukum Keluarga Islam*, 3.2 (2025), https://doi.org/10.35905/marital_hki.v3i2.4054.

¹² Seila Amalia and others, 'Analysis of the Most Dominant Causing Factors of Divorce in 34 Provinces in Indonesia Using the XGBoost Algorithm', *EduMatika: Jurnal MIPA*, 5.2 (2025), 9–13, <https://doi.org/https://doi.org/10.56495/emju.v5i2.1135>.

approach capable of measuring and describing the spatiotemporal shifts in the composition of factors causing divorce cases is required.

The spatio-temporal approach is an analytical framework capable of describing changes in phenomena based on both time and location simultaneously¹³. In the context of divorce cases, a temporal approach is needed to identify changes in the distribution of causal factors across time periods, while a spatial approach is needed to determine variations in these changes across regions. Combining these two approaches makes it possible to identify regions experiencing the greatest shifts in the patterns of divorce causes as well as regions with relatively stable causal structures.

To quantitatively measure shifts in the composition of factors contributing to divorce cases, this study combines two measures: changes in proportion and Total Variation Distance (TVD). Changes in proportion are used to identify increases or decreases in the relative contribution of each factor contributing to divorce cases across periods, while TVD measures the magnitude of the overall shift in the composition distribution. The use of these two measures allows for analysis not only at the level of individual contributing factors but also of changes in the aggregate composition structure. Thus, this study is able to describe the dynamics of the composition of factors contributing to divorce cases more comprehensively than analyses based solely on the absolute number of cases.

The island of Sulawesi was selected as the study area because of its diverse social and demographic characteristics. The six provinces in this region—West Sulawesi, South Sulawesi, Central Sulawesi, Southeast Sulawesi, North Sulawesi, and Gorontalo—exhibit variations in both the number of divorce cases and the composition of their underlying causes. This diversity provides an opportunity to examine how shifts in the composition of divorce causes occur across regions with different characteristics, both spatially and temporally.

Based on this background, this study aims to analyze shifts in the composition of factors contributing to divorce cases on the island of Sulawesi during the 2023–2025 period using spatio-temporal analysis. The analysis was conducted in three stages: presenting the percentage distribution of factors causing divorce, measuring the direction of change in the proportion of each factor between periods, and measuring the degree of compositional shift using TVD. Furthermore, the calculated values were visualized in the form of spatial maps to illustrate variations in the degree of compositional shifts across provinces. The results of this study are expected to provide a more comprehensive understanding of the dynamics of the composition of factors contributing to divorce cases in the Sulawesi region and to serve as a basis for developing more adaptive divorce prevention policies tailored to the characteristics of each region.

¹³ Zhenmin Dong and Chunfang Guo, 'A Literature Review of Spatio-Temporal Data Analysis', *Journal of Physics: Conference Series*, 1792.1 (2021), <https://doi.org/10.1088/1742-6596/1792/1/012056>.

METHOD

Research Data

The data used in this study are secondary data obtained from the Central Statistics Agency's (BPS) divorce statistics publications for the 2023–2025 period. The data cover six provinces on the island of Sulawesi: West Sulawesi, South Sulawesi, Central Sulawesi, Southeast Sulawesi, North Sulawesi, and Gorontalo. The variables analyzed are the number of divorce cases based on causal factors, which include constant disputes and arguments, abandonment of one party, domestic violence, economic issues, alcohol abuse, gambling, apostasy, polygamy, imprisonment, drug addiction, adultery, forced marriage, and physical disability. The data are presented as the number of cases for each cause in each province and year of observation.

Descriptive Analysis of Composition Percentages

An initial analysis was conducted using descriptive analysis through the calculation of composition percentages to illustrate the distribution of factors contributing to divorce in each province and year of observation. This analysis aims to identify the extent of each contributing factor's contribution to the total number of divorce cases in a specific region and period. Composition percentages were calculated based on the concept of relative frequency, which is the ratio of the frequency of a category to the total frequency, expressed as a percentage¹⁴. In this study, the frequency of a category refers to the number of divorce cases based on a specific contributing factor, while the total frequency refers to the total number of divorce cases in the same province and year. Based on this concept, the percentage composition of each factor causing divorce is calculated using the following equation:

$$P_{ijt} = \frac{X_{ijt}}{\sum_{j=1}^k X_{ijt}} \times 100 \quad (1)$$

With :

P_{ijt} : The percentage share of divorce factor j in province i in year t ;

X_{ijt} : The number of divorce cases resulting from factor j ;

k : The number of divorce factors.

The percentage values indicate the relative contribution of each factor causing divorce to the total number of divorce cases in each province and year of observation. The higher the percentage value of a factor, the more dominant that factor is in shaping the structure of divorce causes in the region and

¹⁴ Alfira Mulya Astuti, *Statistika Penelitian* (Insan Madani Publishing Mataram, 2026), hlm. 16.

period under observation. Conversely, the lower the percentage value, the smaller the factor's contribution to the total number of divorce cases.

Analysis of Shifts in Factor Composition

To identify increases or decreases in the relative contribution of each factor contributing to divorce cases across periods, this study calculated the changes in the proportions of each contributing factor in each province. Changes in proportion are derived from the difference between the proportion of a factor in the t th observation year and its proportion in the previous year ($t - 1$); thus, the analysis is conducted sequentially for the periods 2023–2024 and 2024–2025. A positive change in proportion indicates an increase in the relative contribution of a contributing factor, while a negative value indicates a decrease in relative contribution. Using this approach, the direction of the shift in the contribution of each contributing factor can be identified for each province during the study period. The change in proportion is calculated using the following equation:

$$\Delta_{Pijt} = P_{ijt} - P_{ij(t-1)}, \quad t = 2024, 2025 \quad (2)$$

with:

Δ_{Pijt} : Change in the proportion of the j th causal factor in the i th province;

P_{ijt} : Proportion of the j th causal factor in the i th province in year t ;

$P_{ij(t-1)}$: Proportion of the j th causal factor in the i th province in the previous year.

In this study, changes in proportion were calculated for two time intervals, namely:

$$\Delta_{Pij,2024} = P_{ij,2024} - P_{ij,2023} \quad (3)$$

$$\Delta_{Pij,2025} = P_{ij,2025} - P_{ij,2024} \quad (4)$$

The values of the changes in proportion are interpreted as follows :

- $\Delta_{Pijt} > 0$ indicates that the relative contribution of the factor causing divorce has increased compared to the previous year.
- $\Delta_{Pijt} < 0$ indicates that the relative contribution of the factor causing divorce has decreased compared to the previous year.
- $\Delta_{Pijt} \approx 0$ indicates that the relative contribution of the factor causing divorce is relatively stable compared to the previous year.

Measuring the Magnitude of Composition Shifts

In addition to analyzing changes in the proportions of each factor contributing to divorce, this study also measures the magnitude of the overall composition shift using Total Variation Distance (TVD). Total Variation Distance (TVD) is a measure of the distance between two probability distributions used to quantify the degree of difference between them¹⁵. In this study, the probability distributions are represented by the distributions of the proportions of factors causing divorce cases in each province and year of observation. Therefore, TVD is used to measure the degree of difference between the distributions of the proportions of factors causing divorce cases in two consecutive years of observation, thereby illustrating the magnitude of the shift in the compositional structure from one year to the next. The larger the TVD value, the greater the difference in the distribution of proportions between periods. Based on the change in proportions calculated using Equation (2), the TVD value is then calculated using the following equation:

$$TVD_{it} = \frac{1}{2} \sum_{j=1}^k |P_{ijt} - P_{ij(t-1)}|, \quad t = 2024, 2025 \quad (5)$$

With :

TVD_{it} : Total Variation Distance value for province i between year t-1 and year t;

P_{ijt} : Proportion of divorce cause factor j in province i in year t;

$P_{ij(t-1)}$: Proportion of the jth divorce factor in the ith province in the previous year;

k : Number of divorce factors

In this study, TVD values were calculated for two time intervals, namely:

$$TVD_{i,2024} = \frac{1}{2} \sum_{j=1}^k |P_{ij,2024} - P_{ij,2023}| \quad (6)$$

$$TVD_{i,2025} = \frac{1}{2} \sum_{j=1}^k |P_{ij,2025} - P_{ij,2024}| \quad (7)$$

TVD values range from 0 to 1, with the following interpretations:

- TVD = 0 indicates that there was no change in the composition of divorce-causing factors between 2023 and 2025.
- The higher the TVD value (the closer it is to 1), the greater the difference in the distribution of the composition of divorce-causing factors between the two observation years.

The TVD values for each province are then used to compare the magnitude of shifts in the composition of divorce-causing factors during each time interval. Provinces with higher TVD values show greater changes in the composition structure, while provinces with lower TVD values show a

¹⁵ Marianthi Markatou and Yang Chen, 'Non-Quadratic Distances in Model Assessment', *Entropy*, 20.6 (2018), <https://doi.org/10.3390/e20060464>.

relatively more stable composition structure. Furthermore, TVD values are compared across provinces and periods to identify regions that experienced the highest dynamics of compositional change during the study period.

RESULTS AND DISCUSSION

Composition of Factors Contributing to Divorce Cases on the Island of Sulawesi, 2023–2025

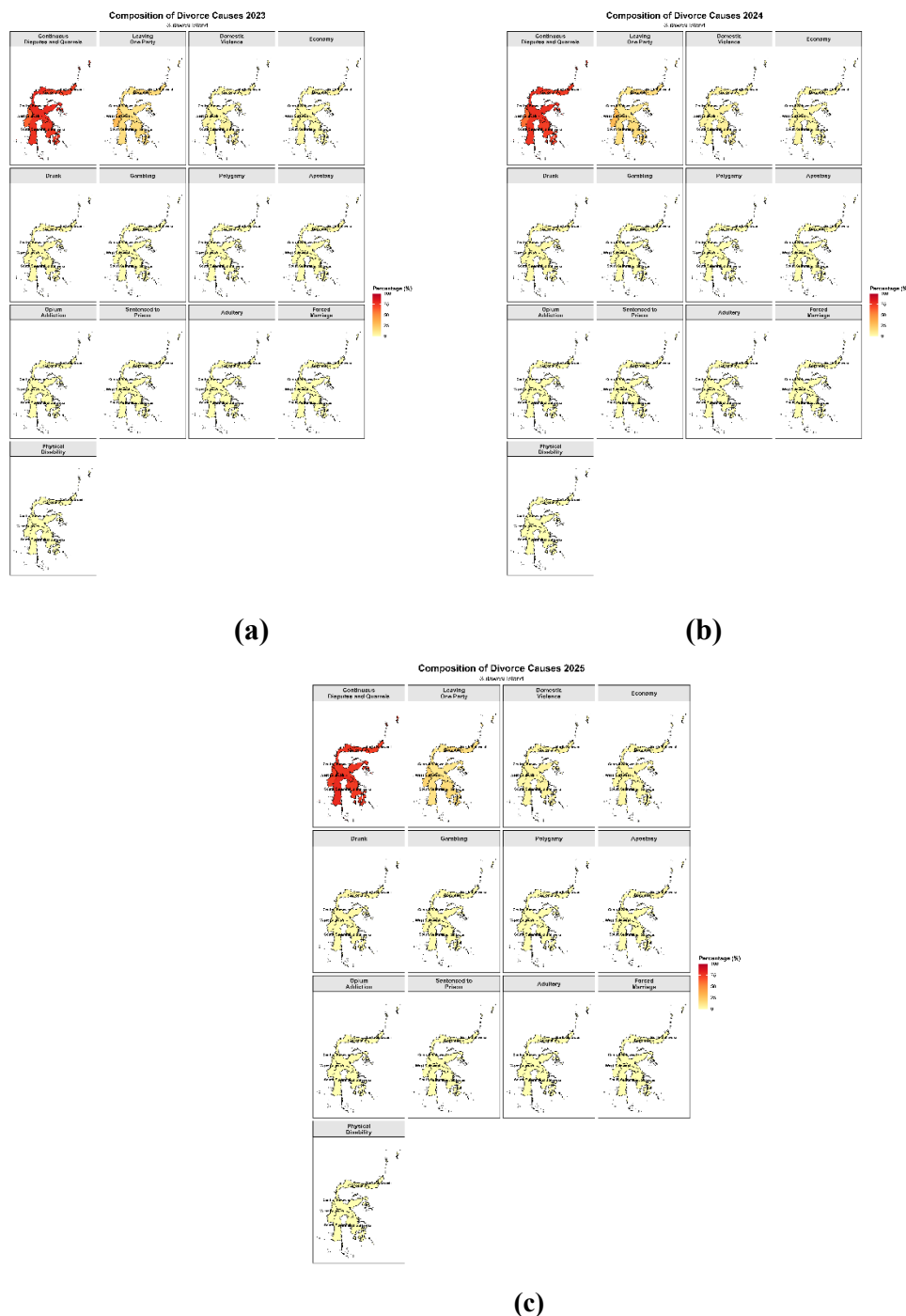


Figure 1. Map of the Distribution of Factors Contributing to Divorce Cases on the Island of Sulawesi:

a) 2023, b) 2024, c) 2025

Figure 1 displays thematic maps for each factor contributing to divorce in 2023, 2024, and 2025. The color intensity for each province represents the percentage composition of the factors causing divorce, where yellow indicates a relatively low proportion, while red indicates a relatively high proportion. Presenting the data in map form allows for the identification of spatial patterns as well as changes in composition across periods, making it possible to observe differences in the characteristics of divorce causes between provinces more clearly.

In general, the visualization results show that constant disputes and arguments were the leading cause of divorce across all provinces in Sulawesi during the 2023–2025 period. This is evident from the predominance of red on the factor map across nearly the entire island of Sulawesi in each year of observation. The proportion of this factor ranged from 58.6% to 79.4% of total divorce cases, making it the primary component in the structure of divorce causes. The factor with the next highest proportion was abandonment by one party, with percentages ranging from 9.3% to 29.9%. In contrast to the factor of continuous disputes and arguments, the color intensity on the map for this factor shows greater variation across provinces. West Sulawesi appears to have a relatively darker color compared to other provinces, indicating that the contribution of the “abandonment by one partner” factor is relatively higher, particularly at the beginning of the observation period.

The map for other contributing factors shows that their contribution to the total number of divorce cases is relatively small. Domestic violence accounts for approximately 2%–6%, while economic factors and alcohol abuse generally range from 1% to 4%. Meanwhile, factors such as gambling, polygamy, apostasy, drug addiction, imprisonment, adultery, forced marriage, and physical disability are predominantly shown in shades of yellow to light orange across nearly all provinces, indicating that each of these factors contributed less than 2% to the total number of divorce cases during the study period. From a spatial perspective, although the patterns of dominance among divorce-causing factors are relatively uniform, there are variations in the intensity of these patterns across provinces. South Sulawesi and Central Sulawesi consistently exhibit higher color intensity on the map for the “constant disputes and arguments” factor compared to other provinces. Conversely, West Sulawesi showed higher color intensity for the “abandonment by one party” factor, while North Sulawesi had a relatively higher proportion of the “apostasy” factor compared to other provinces, although its contribution to the total number of divorce cases remained low.

A comparison of the maps for 2023, 2024, and 2025 shows that the composition of the factors causing divorce has remained relatively unchanged. The spatial distribution patterns of each factor tend to remain consistent, with constant disputes and arguments consistently being the dominant cause across all provinces, followed by one party leaving the other. The changes observed are primarily reflected in shifts in color intensity across several provinces, indicating significant year-over-year changes in the

proportions of each factor without altering the overall structure of divorce causes on the island of Sulawesi.

Shifts in the Composition of Factors Contributing to Divorce Cases on the Island of Sulawesi, 2023–2025

Based on Changes in Proportions on Sulawesi Island, 2023–2025 The shift in the composition of factors causing divorce was analyzed using the Change in Proportion (ΔP) approach to identify changes in the relative contribution of each factor causing divorce to the total number of divorce cases in each province. Unlike analyses based on absolute numbers, the Change in Proportion provides insight into which factors have increased or decreased in dominance within the structure of divorce causes over time. A positive ΔP value indicates an increase in a factor's contribution to the composition of divorce causes, while a negative ΔP value indicates a decrease in relative contribution.

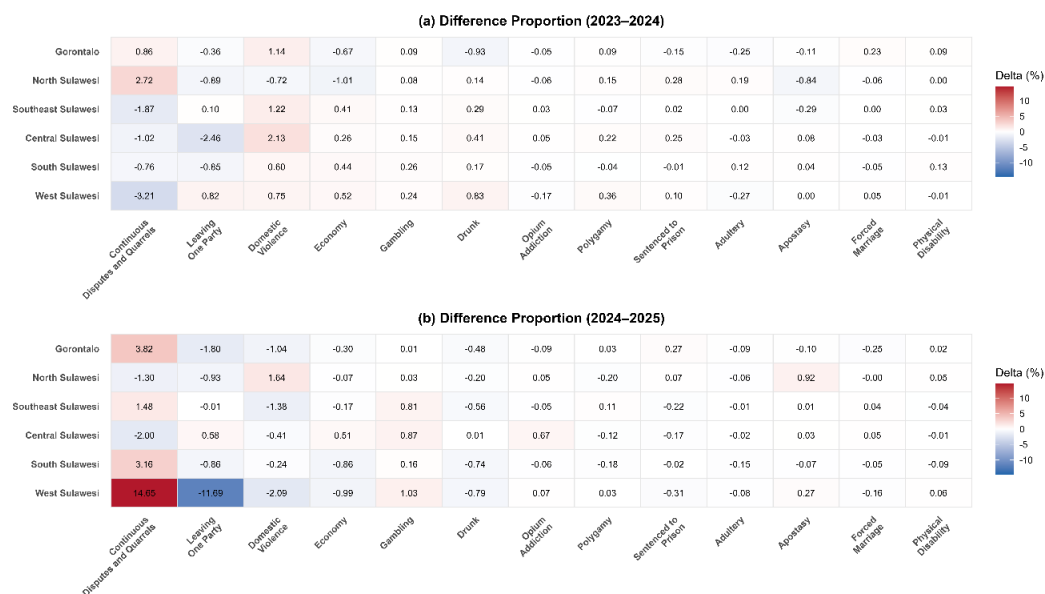


Figure 2. Spatiotemporal Patterns of Shifts in the Composition of Factors Contributing to Divorce

Figure 2 illustrates the patterns of shifts in the composition of factors contributing to divorce across six provinces on the island of Sulawesi during two observation periods: 2023–2024 and 2024–2025. Color intensity indicates the magnitude of the change in proportion, with red representing an increase in the contribution of a factor causing divorce and blue indicating a decrease in contribution. The visualization results show that changes in the composition of divorce causes exhibit different patterns across provinces, indicating regional characteristics in the dynamics of factors causing divorce. During the 2023–2024 period, “constant disputes and arguments” remained the factor with the largest contribution to the composition of divorce causes across all provinces. However, changes in its proportion showed spatial variation. An increase in contribution was observed in Gorontalo, with a ΔP value of 0.86%, and in North Sulawesi, at 2.72%, while decreases were recorded in West Sulawesi (-3.21%), South Sulawesi (-0.76%), Central Sulawesi (-1.02%), and Southeast Sulawesi (-1.87%). This

pattern indicates that although domestic conflict remains the primary cause of divorce, its level of dominance has undergone relative changes due to shifts in the contributions of other contributing factors.

During the 2024–2025 period, there was a more pronounced shift in the pattern of factors contributing to ongoing disputes and arguments. Most provinces experienced an increase in this factor's contribution, particularly West Sulawesi with a ΔP value of 14.65%, followed by Gorontalo at 3.82%, South Sulawesi at 3.16%, and Southeast Sulawesi at 1.48%. This increase indicates the growing dominance of interpersonal conflict as the primary cause of divorce in these regions. Conversely, Central Sulawesi (-1.99%) and North Sulawesi (-1.30%) experienced a decrease in contribution, indicating a relative increase in the role of other contributing factors within the structure of divorce in these two regions. Aside from disputes, the factor of abandonment by one party showed a significant shift in contribution. During the 2023–2024 period, this factor increased in West Sulawesi (0.82%) and Southeast Sulawesi (0.10%), but decreased in South Sulawesi (-0.85%), Central Sulawesi (-2.46%), and North Sulawesi (-0.89%). The most significant change occurred during the 2024–2025 period, when West Sulawesi saw a decrease in this factor's contribution of -11.69%. This decline indicates that, although the factor of abandonment is still present in divorce cases, its contribution to the structure of divorce causes has decreased relative to other factors.

The factor of domestic violence exhibits a dynamic pattern of change across periods. During the 2023–2024 period, nearly all provinces saw an increase in the contribution of this factor, particularly Central Sulawesi with a ΔP of 2.13%, Southeast Sulawesi at 1.22%, and Gorontalo at 1.14%. These conditions indicate an increased role of the domestic violence factor in shaping the composition of divorce causes during that period. However, during the 2024–2025 period, a reversal occurred, with most provinces experiencing a decline in this factor's contribution, such as West Sulawesi (-2.09%) and Southeast Sulawesi (-1.38%). Meanwhile, North Sulawesi was the only province to show an increase in contribution of 1.64%. Regarding economic factors, changes in relative contribution exhibited a more moderate pattern compared to other major factors. The 2023–2024 period showed an increase in the economic contribution in most provinces, namely Gorontalo, West Sulawesi, South Sulawesi, Central Sulawesi, and Southeast Sulawesi. However, during the 2024–2025 period, most regions experienced a decline in economic contribution, with the exception of Central Sulawesi, which increased by 0.51%. This indicates that economic factors remain one of the key contributors to divorce, but their level of contribution fluctuates as the dominance of other factors rises or falls.

Meanwhile, factors contributing to divorce with relatively small proportions—such as gambling, alcoholism, polygamy, apostasy, adultery, forced marriage, physical disability, and imprisonment—show more fluctuating trends. Some factors saw an increase in their contribution in certain regions; for example, gambling as a factor increased in most provinces during the 2024–2025

period. Central Sulawesi and Southeast Sulawesi showed the largest increases, at 0.87% and 0.81%, respectively. Although their contributions remain relatively small compared to the dominant factors, these changes indicate social dynamics that influence the structure of divorce causes at the regional level.

Overall, the results of the Proportion Change analysis indicate that the composition of divorce causes on the island of Sulawesi has undergone spatial and temporal shifts. The factors of disputes and constant quarrels remain the dominant causes, but the degree of their dominance varies across provinces and periods. The largest shifts occurred in the factors of domestic conflict and abandonment of one spouse, while factors with smaller proportions exhibited more volatile changes. These findings suggest that divorce dynamics are influenced not only by changes in the number of cases but also by changes in the relative structure of causal factors that shape divorce patterns in each region.

The Magnitude of Shifts in the Composition of Factors Contributing to Divorce Cases on the Island of Sulawesi, 2023–2025

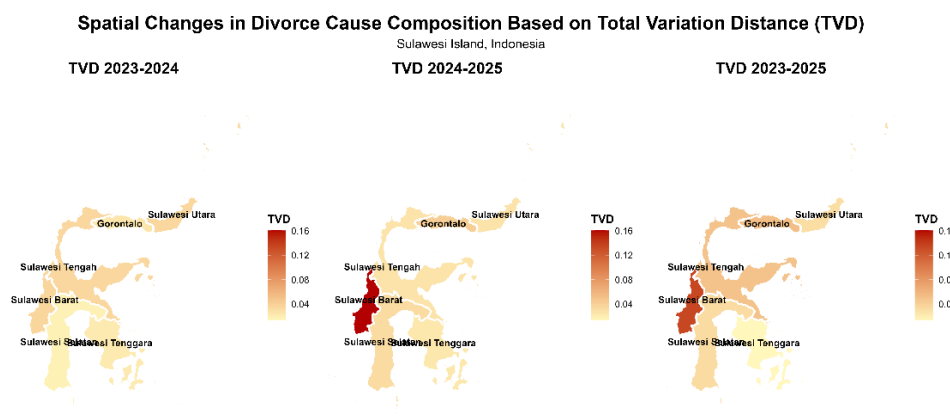


Figure 3. Spatial Mapping of Total Variation Distance (TVD) for Factors Contributing to Divorce on the Island of Sulawesi, 2023–2025

The magnitude of shifts in the composition of factors causing divorce across periods was analyzed using Total Variation Distance (TVD) and visualized as a spatial map in Figure 3. TVD was used to measure the degree of change in the overall distribution of the composition of factors causing divorce in each province. A higher TVD value indicates that the composition of factors causing divorce has undergone greater change, while a lower TVD value indicates that the composition of factors causing divorce is relatively more stable.

Based on the results of TVD spatial mapping, it appears that all provinces on the island of Sulawesi have experienced a shift in the composition of factors contributing to divorce, though the degree of change varies across regions. The variations in color intensity on the map indicate differences in the magnitude of changes in the structure of divorce causes among provinces during the observation

period. During the 2023–2024 period, TVD values ranged from 0.0175 to 0.0367. The province with the greatest shift in composition was West Sulawesi, with a TVD value of 0.0367, followed by North Sulawesi (0.0356) and Central Sulawesi (0.0354). Meanwhile, the province with the lowest change in composition was South Sulawesi, with a TVD value of 0.0175. These results indicate that during the early part of the observation period, changes in the structure of divorce-causing factors were relatively more pronounced in West Sulawesi compared to other provinces, whereas South Sulawesi exhibited a relatively more stable composition.

In the subsequent period, namely 2024–2025, there was an increase in the variation in TVD values across provinces. The largest shift in composition occurred in West Sulawesi, with a TVD value of 0.1611, indicating the highest change in the structure of factors causing divorce during the study period. This value was significantly higher than that of other provinces, such as Gorontalo (0.0415), South Sulawesi (0.0332), North Sulawesi (0.0276), Central Sulawesi (0.0273), and Southeast Sulawesi (0.0245). The dominance of West Sulawesi's TVD value indicates a highly significant shift in the distribution of factors contributing to divorce between 2024 and 2025.

Cumulatively over the 2023–2025 period, the spatial pattern of TVD indicates that West Sulawesi is the region with the greatest change in composition, with a TVD value of 0.1345. Furthermore, relatively higher changes were also found in Gorontalo (0.0524) and Central Sulawesi (0.0495). In contrast, Southeast Sulawesi showed the lowest TVD value at 0.0134, indicating that the composition of divorce-causing factors in that region underwent relatively minor changes during the observation period. The high TVD value in West Sulawesi is primarily associated with simultaneous changes in the proportions of several divorce-causing factors. Based on the results of the previous analysis of changes in proportions, West Sulawesi experienced a significant increase in the factors of “disputes” and “constant arguments,” while the factor of “one party leaving” saw a fairly substantial decrease during the 2024–2025 period. Changes in these primary factors led to a more significant redistribution in the composition of divorce causes, resulting in the highest TVD value compared to other provinces.

Conversely, low TVD values in some regions indicate that, although changes have occurred in certain factors, these changes have not yet led to a major shift in the overall structure of divorce causes. This suggests that the composition of divorce causes in these regions has remained relatively consistent across periods. In general, the results of TVD spatial mapping show that the dynamics of changes in the composition of divorce causes on the island of Sulawesi exhibit an uneven pattern. Regions with high TVD values indicate a greater transformation in the structure of divorce causes, while regions with low TVD values indicate relative stability in the distribution of divorce causes. Thus, the TVD approach is able to identify regions that experienced the most dynamic changes in the composition of divorce causes during the study period.

Policy Implications Based on Shifts in the Composition of Divorce Causes

The results of the spatio-temporal analysis show that changes in the composition of divorce causes on the island of Sulawesi do not occur uniformly across regions. Differences in TVD values indicate that some provinces experience more dynamic changes in the structure of divorce causes compared to other regions. Therefore, policy intervention strategies need to take into account the spatial characteristics and the dominant factors undergoing change in each region.

Provinces with high TVD scores, particularly West Sulawesi, show a greater shift in the composition of factors contributing to divorce compared to other provinces. This situation indicates the need to strengthen region-based divorce prevention programs through approaches that are more adaptive to changes in the dominant contributing factors. Programs such as family counseling, pre-divorce mediation, strengthening family resilience, and education on communication within the household can be directed more intensively toward regions with high dynamics of change in the composition of these factors.

Furthermore, the increasing dominance of factors such as disputes and ongoing arguments in most regions indicates that interpersonal conflicts within the household are a critical aspect of divorce prevention. Therefore, relevant institutions such as religious courts, the Office of Religious Affairs (KUA), and family empowerment agencies can strengthen services for marriage guidance, family counseling, and domestic conflict mediation as preventive measures before divorce cases enter the litigation stage.

Meanwhile, the fact that economic factors continue to emerge as a cause of divorce in some regions highlights the need to integrate socio-economic approaches into family resilience programs. Interventions should not only focus on legal aspects of family life but also include programs to enhance families' economic capacity through community empowerment and the strengthening of household income sources.

CONCLUSION AND RECOMMENDATIONS

This study successfully analyzed shifts in the composition of factors contributing to divorce cases on the island of Sulawesi during the 2023–2025 period using a spatio-temporal approach through percentage composition analysis, Proportion Change, and Total Variation Distance (TVD). The results of the percentage composition analysis show that continuous disputes and arguments were the most dominant factors causing divorce across all provinces during the study period, followed by abandonment by one party, while other factors such as polygamy, adultery, physical disability, forced marriage, and imprisonment accounted for relatively small proportions. Nevertheless, there were significant variations in the contribution of each factor across provinces and years.

An analysis of changes in proportions shows that shifts in the composition of divorce causes did not occur uniformly. In most provinces, there was an increase in the proportion of “constant disputes and quarrels,” while other factors—such as abandonment by one spouse, economic issues, and domestic violence—tended to decline in some regions. These results indicate that the dynamics of changes in the structure of divorce causes differed across periods and provinces. Measurements using Total Variation Distance (TVD) indicate that the magnitude of shifts in the composition of factors contributing to divorce also varies spatially. West Sulawesi is the province that experienced the greatest change in compositional structure over nearly the entire observation period, with the highest TVD value in the 2024–2025 interval (0.1611) and cumulatively from 2023 to 2025 (0.1345). Conversely, Southeast Sulawesi showed the smallest relative cumulative change in composition, with a TVD value of 0.0134, indicating that the structure of divorce causes in that region is relatively stable.

Overall, this study demonstrates that changes in the factors causing divorce are reflected not only by changes in the number of cases but also by changes in the compositional structure of those causes. The integration of compositional percentage analysis, Proportion Change, and TVD provides a more comprehensive picture of the dynamics of divorce causes from both temporal and spatial perspectives. Thus, this approach can serve as a basis for developing more adaptive divorce prevention policies tailored to the characteristics of each region.

This study still has limitations because it employs a descriptive approach through the analysis of compositional percentages, changes in proportions, and Total Variation Distance (TVD), thus focusing on identifying patterns and the magnitude of shifts in the composition of factors causing divorce without inferentially analyzing the factors influencing those changes. Therefore, the results of this study can be viewed as a baseline for understanding the dynamics of the composition of divorce causes on the island of Sulawesi. Future research is expected to develop analyses using more comprehensive statistical approaches, such as spatial-temporal modelling or other multivariate methods, so that it is not only able to describe the magnitude of compositional shifts but also to identify the factors contributing to these changes.

REFERENCES

- Amalia, S., Banjarnahor, R. M., Hutapea, R. O., Sitorus, G. F., Domini, G., & Arnita. (2025). Analysis of the Most Dominant Causing Factors of Divorce in 34 Provinces in Indonesia Using the XGBoost Algorithm. *EduMatika: Jurnal MIPA*, 5(2), 9–13. <https://doi.org/https://doi.org/10.56495/emju.v5i2.1135>
- Astuti, A. M. (2026). *Statistika penelitian*. Insan Madani Publishing Mataram.
- Badan Pusat Statistik. (2023). *Jumlah Perceraian1 Menurut Provinsi dan Faktor, 2023*. Badan Pusat Statistik. <https://www.bps.go.id/id/statistics->

- table/3/YVdoU1IwVmlTM2h4YzFoV1psWkViRXhqTlZwRFVUMDkjMw==/jumlah-perceraian-menurut-provinsi-dan-faktor-penyebab-perceraian--perkara---2024.html?year=2023
Badan Pusat Statistik. (2024). *Jumlah Perceraian Menurut Provinsi dan Faktor Penyebab Perceraian (perkara), 2024*. Badan Pusat Statistik. <https://www.bps.go.id/id/statistics-table/3/YVdoU1IwVmlTM2h4YzFoV1psWkViRXhqTlZwRFVUMDkjMw==/jumlah-perceraian-menurut-provinsi-dan-faktor-penyebab-perceraian--perkara---2024.html?year=2024>
Badan Pusat Statistik. (2025). *Jumlah Perceraian Menurut Provinsi dan Faktor Penyebab Perceraian (perkara), 2024-2025*. Badan Pusat Statistik. <https://www.bps.go.id/id/statistics-table/3/YVdoU1IwVmlTM2h4YzFoV1psWkViRXhqTlZwRFVUMDkjMw==/jumlah-perceraian-menurut-provinsi-dan-faktor-penyebab-perceraian--perkara---2024.html?year=2025>
Dong, Z., & Guo, C. (2021). A literature review of spatio-temporal data analysis. *Journal of Physics: Conference Series*, 1792(1). <https://doi.org/10.1088/1742-6596/1792/1/012056>
Izzati, N. R., A'dawiyah, R., & Zaelani, A. Q. (2024). Perceraian Dalam Perspektif Normatif-Yuridis dan Psikologis. *Journal of Islamic and Law Studies*, 8(1), 62–81. <https://doi.org/https://doi.org/10.18592/jils.v8i1.12853>
Manna, N. S., Doriza, S., & Oktaviani, M. (2021). Cerai Gugat: Telaah Penyebab Perceraian Pada Keluarga di Indonesia. *JURNAL AL-AZHAR INDONESIA SERI HUMANIORA*, 6(1), 11. <https://doi.org/http://dx.doi.org/10.36722/sh.v6i1.443>
Markatou, M., & Chen, Y. (2018). Non-quadratic distances in model assessment. *Entropy*, 20(6). <https://doi.org/10.3390/e20060464>
Munawara, N., Hasan, M., & Ardiansyah. (2021). FAKTOR-FAKTOR PENYEBAB PERCERAIAN PADA PERNIKAHAN DINI DI PENGADILAN AGAMA KELAS I-B SAMPAS. *AL-USROH*, 1(2), 107–131. <https://doi.org/https://doi.org/10.24260/al-usroh.v1i2.393>
Nurhalisa, R. (2021). Tinjauan Literatur: Faktor Penyebab dan Upaya Pencegahan Sistematis Terhadap Perceraian. *Media Gizi Kesmas*, 10(1), 157. <https://doi.org/10.20473/mgk.v10i1.2021.157-164>
Rahman, J. F., & Hamdan, F. F. R. S. (2024). Faktor-Faktor Penyebab Tingginya Angka Perceraian di Kabupaten Purwakarta Tahun 2021-2023. *Jurnal Riset Hukum Keluarga Islam (JRHKI)*, 4(2), 97–104. <https://doi.org/https://doi.org/10.29313/jrhki.v4i2.5192>
Setiadi, T. F., Prambudi, L. A., & Azzahra, M. P. (2025). Disintegrasi Rumah Tangga: Faktor Perceraian dalam Tinjauan Sistematis terhadap Krisis Perkawinan Kontemporer. *Marital: Jurnal Hukum Keluarga Islam*, 3(2). https://doi.org/10.35905/marital_hki.v3i2.4054
Siburian, B. (2019). Analisis Faktor-Faktor Penyebab Perceraian Berdasarkan Keputusan Pengadilan Negeri Balige Tahun 2017. *Jurnal Ilmiah Religiosity Entity Humanity (JIREH)*, 1(1), 31–39. <https://doi.org/10.37364/jireh.v1i1.5>
Wartono, N., & Akbarizan. (2025). Analisis Komparatif Faktor Penyebab Terjadinya Perceraian Di

Negara-Negara Muslim. *MAQASID: Jurnal Studi Hukum Islam*, 14(3), 124–142.
<https://doi.org/https://doi.org/10.30651/mqsd.v14i3.28617>