“Influence of state policy components on the rate of violence and crime against human life and health”

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INFLUENCE OF STATE POLICY COMPONENTS ON THE RATE OF VIOLENCE AND CRIME AGAINST HUMAN LIFE AND HEALTH

Abstract

The share of crimes against human life and health on average is up to 10% worldwide, and losses are estimated from 0.3 to 3% of GDP. This study examines the dependence of the rate of violence and crime against human life and health on the state policy elements in the example of transitioning and developing countries. The crime index, the share of people reporting crime, the rate of violence or vandalism in the area, and the number of intentional homicide offenses in the largest cities were used as parameters characterizing the rate of violence and crime against human life and health. All parameters were divided into institutional, social, and economic. The dependence between the indicators was studied using fixed-effects and random-effects models; a grouping of countries according to the nature of this dependence employed the iterative separation method of k-means and tree clustering. Based on the results, it is justified that institutional and economic (highest GDP and real minimum wages) components significantly influence the level of violence and crime against human life and health. For example, the average value of the crime index for the fourth cluster is 29.98 compared to 54.09 for the first cluster. At the same time, strengthening responsibility for committed crimes has a more negligible impact on the crime level than increasing the material well-being of the population and supporting its vulnerable segments.

Keywords public management, scenario modeling, legal, law, crime against human life and health, violence, clustering

JEL Classification K14, K42, H70, B55

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INTRODUCTION

Nowadays, the problem of a high level of violence and crimes against human life and health is a global problem in the healthcare system and social, administrative, and legal protection of human rights. According to the UN Office on Drugs and Crime, in 2021, almost 233,000 people were victims of intentional murder, and 2.2 million people suffered grievous bodily harm. Most of these cases occurred in low- and middle-income countries, with the highest rates observed in Latin America, the Caribbean, Southern Asia, and Northern America.

During the COVID-19 pandemic, the number of crimes against human life and health registered by the police in El Salvador, Guatemala, Honduras, and Venezuela (historically some of the most homicidal nations in Latin America and the Caribbean where the pandemic took center stage) decreased significantly. Therefore, the total rate of crime against human life and health in Venezuela in 2021 was 86.76, in South Africa – 76.86, and in Brazil – 67.49; in economically developed countries, this indicator was much lower (Switzerland – 21.62, Slovenia – 22.28, Croatia – 24.59, and Bulgaria – 38.21). The highest level of crime against human life and health is observed in countries with low and medium economic and social development levels.

Every year around the world, about 140,000 people aged 10-29 die due to intentional and negligent homicide. According to the World Health Organization, violence against people is the fourth most significant cause of death of people of this age category. Moreover, it is an adverse threat to the development of these countries, as it is associated with significant economic losses of human capital. Thus, in countries with a high income level, the cost of intentional and negligent homicide is estimated at 0.21% of GDP on average. However, in Latin America and the Caribbean, it exceeds 2%. This leads to significant economic losses for the development of these countries.

Considering these facts, there is a need to identify the factors that lead to an increase in the rate of crimes against human life and health and improve components of state prevention policy on violence and crimes against human life and health.

1. LITERATURE REVIEW

Despite the high level of crimes in the world, systematization of scientific literature proved the lack of a unified understanding of the determinants that affect the growth of violence and crimes against human life and health. According to the legislation of many countries, this category of crimes includes intentional homicide, homicide due to negligence, intentional homicide by the mother of her newborn child, intentional grievous bodily harm, intentional minor bodily harm, torture, and abandonment (Cornelius et al., 2017; Imrohoroglu et al., 2004; Touil Ait & Jabraoui, 2022; Ray, 2022).

Numerous studies are devoted to the analysis of the relationship between the level of crime against human life and health and indicators of social protection of the population, in particular, the level of poverty (Dreze & Khera, 2000; Didenko et al., 2020), the level of education, social inequality (Bourguignon, 1999; Kelly, 2000; Mukherjee, 2019; Contreras-Pacheco et al., 2022; Sotnikova & Ahaverdiieva, 2019; Velychko et al., 2022), health inequalities, and social capital (Cameron & Shah, 2014; Chugunov et al., 2022; Blakyta et al., 2018; Marinova et al., 2022).

Thus, Bourguignon (1999) claimed that the key to reducing the level of violence and crime against human life and health is compliance with the principle of the equal and fair income distribution. Kelly (2000) analyzed the relationship between income inequality and urban crime against human life and health. The study proved that income inequality is a strong predictor of the impact on the level of violence but not property crime. At the same time, the level of population poverty and economic growth significantly affect property crimes and practically do not affect the level of violent crimes. Therefore, the key vectors of reducing the level of crime against human life and health should be ensuring a fair income and a sufficient level of economic growth.

In contrast to previous research, Dreze and Khera (2000), based on a dataset analysis of intentional homicide rates in India, concluded that there was no significant relationship between urbanization/poverty and intentional homicide and homicide due to negligence rate. At the same time, the literacy level and the ratio of women to men are drivers of the decrease in violence in India.

Zaman (2018) and Zaman et al. (2019) investigated the cause-and-effect relationship between a crime against human life and health and poverty levels. The lack of education, unemployment, unfair reasonable distribution of income, injustice, price increase, and insufficient healthcare are the main prerequisites for an increased rate of crimes against human life and health in Pakistan. The provision of social subsidies to the poor and marginalized sections of the population is the main direction of the fight against crime against human life and health.

Piatkowska (2020) examined the impact of poverty on suicide rates, crimes against human life and health, and overall violence in the United States and 15 European countries. Based on the poverty level analysis, the study substantiated that the indicators of suicides, crimes against human life and health, and violent acts are significantly increasing due to an increase in the relative level of poverty and child mortality.

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Peculiarities of the influence of the level of education on crime rates in countries were widely investigated. Thus, the level of education has a positive effect on reducing the total rate of crime against human life and health in Indonesia (Nguyen, 2019), the United States of America (Bell et al., 2016; Fast, 2021), Sweden (Hjalmarsson et al., 2015), and Chile (Berthelon & Kruger, 2011). Furthermore, the studies argued that the longer the education in a country, the lower the crime rate (Bell et al., 2016; Berthelon & Kruger, 2011). Thus, Bell et al. (2016) hypothesized that an increase in the level of education increases the negative attitude of citizens toward crime and increases the opportunity cost of illegal activity by increasing the potential income from the legal activity. In addition, Muryani and Esquivias (2021) proved that obtaining a school education creates additional opportunities for employment and growth of the population's income level.

Many scientists consider economic growth the main driving force for overcoming crime against human life and health. Thus, Duque and Mcknight (2019), Enamorado et al. (2016), Widyastaman and Hartono (2022), Lyulyov et al. (2021), Tiutiunyk et al. (2021), Vasylyeva et al. (2014), Li et al. (2019), and Klochko et al. (2020) argued that although the reason for violations, inaction, or actions against the law can often be impulsiveness, rage, or mental stress, in most cases crime against human life and health is an economic phenomenon.

Roman (2013) estimated the relationship between GDP and violence and property crime levels. It was substantiated that with an increase in GDP per capita, the level of personal wealth increases. This has a positive effect on the poverty level of the population. At the same time, direct GDP growth leads to increased tax revenues, which allows for increased spending on public services, including crime against human life and health prevention. The study emphasized that with an increase in GDP per capita, there is an increase not in the real level of violence but in its registered indicators. The reason for this is the increase in the ability of the police to ensure compliance with the law due to the increase in costs for law enforcement agencies.

Khan et al. (2015) substantiated the critical role of the level of economic development indicators in reducing the total rate of crime against human life and health in Pakistan. Based on data from 1972 to 2015, it was proved that GDP per capita reduces the level of crime against human life and health in the short term and causes its growth in the long term.

Unlike previous studies, Sugiharti et al. (2022) investigated the complex impact of economic and social factors on the crime rate (crime against human life and health, murder, rape, physical violence, robbery, and fraud) in 34 provinces of Indonesia. According to the econometric modeling, income inequality causes higher criminal activity. On the other hand, a decrease in the level of unemployment, an increase in the amount of investment (foreign and domestic) and indicators of human development (education and healthcare), the amount of public spending on social assistance, and the effectiveness of crime investigations contribute to a decrease in the crime level.

The role of the quality of the institutional component in combating crime against human life and health was investigated by Pierskalla (2016), Aliyeva (2022), De Juan et al. (2015), Vyas-Doorgapersad (2022), Yarovenko and Rogkova (2022), and Salmanov (2021). Thus, Pierskalla and Sacks (2017) assumed that the implementation of decentralization policies, which contributed to more effective state management, allowed to reduce the level of violence in Indonesia.

Numerous studies prove the importance of the development of public infrastructure and investment and the reduction of unemployment in the growth of income inequality (Anser et al., 2020; Hardiawan et al., 2019; Hendri & Muharja, 2013; MacNeil et al., 2022; Salisu, 2022). This, in turn, can lead to a decrease in the level of violence and crime (Muryani et al., 2021; Tadjoeddin, 2019). In addition, Mukherjee (2019), based on the analysis of data for 2005–2016, substantiated the need for developing socio-economic infrastructure to create security for the poor to reduce crimes against human life and health.

Many scientific papers are devoted to determining the relationship between a person's age and his/her propensity for crime. Thus, Sampson and Laub (2003) claimed that as a person's age increases, at each turning point in life (graduation from high school or college, military service, marriage, purchase of real estate, or birth of chil-

dren), the level of his/her propensity for criminal activity decreases.

The results of the conducted analysis indicate the impact of various factors on crimes against human life and health. At the same time, there is currently no practical and unified toolkit for reducing its level. The reason for this is significant differences in the regulatory framework and methods of registration and reporting in state control bodies. Eliminating these factors is possible only through the structural transformation of the economic and legal system in the country and the determination of the mechanisms for strategic public management, which are most sensitive to changes in the economic, legal, and social components of state policy.

Thus, this study aims to analyze the influence of state policy components on the rate of violence and crime against human life and health.

2. METHODOLOGY

Determination of the most influential and expedient instruments for the prevention of crimes against human life and health is done with the cluster analysis. The data from the World Bank, the European Commission, the Organization for Economic Cooperation and Development, and the World Economic Forum are the information base of the study. The research period is 2011–2020. The research object is the influence of components of state policy on the indicators characterizing the rate of violence and crime against human life and health in the example of transitioning (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak, and the Republic of Slovenia) and 149 developing countries. The methodological tools of the conducted research are data-mining methods, Stata, and Statista software packages.

The initial stage of the study is the formalization of indicators that reflect the rate of violence and crime against human life and health. Based on the analysis of the data set, the indicators included the crime index (CI), the share of people reporting crimes (PRC), the rate of violence or vandalism in the area (VV), and the number of intentional homicide offenses in the largest cities (HOC).

The clustering of countries is based on the formalization of indicators that affect the quality and speed of implementation of these measures. Such indicators comprise:

1) the institutional and financial components of the effectiveness of the policy combating crimes against human life and health include general government expenditure by function (GGE); trust in institutions (RTI); prison capacity and number of persons held (PC); number of criminal cases processed in first instance courts by the legal status of the court process (CC);

2) drivers of changes in the level of crime against human life and health in the country include:

- indicators of social development that determine the propensity of the population to commit crimes: (Gini index (GI); the ratio of the average income of the richest 10% to the poorest 10% (AI10); the ratio of the average income of the richest 20% to the poorest 20% (AI20); inequality-adjusted Human Development Index (HDI), government expenditure on education, % of GDP (GEE)); population living in slums, % of urban population (PS); Cost of Living Index (CLI), urban population, % of total population (UP); children out of school, % of primary school age (COS); government expenditure on education, % of GDP (GEE);

- indicators of economic development, which determine the level of material well-being of the population and its satisfaction with living conditions: GDP, real minimum wages (RMW), level of inflation (INF), level of the tax burden (TB), and International Digital Economy and Society Index (IDECI).

At the next stage, the optimal number of clusters (using agglomerative methods of minimum dispersion) is determined by:

- normalization of initial data;

- determination of the parameters of the matrix of distances or the matrix of measures of closeness;

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- sequential merging of a pair of nearest clusters. At the initial stage, each object is considered a point in a multidimensional space of features used to describe it. Similarities and differences between points are under the metric distances between them.

For this, the homogeneity of objects is given:

- introducing a rule for calculating the distances $d(x_i, x_j)$ between any pair of researched objects $(x_1, x_2, \ldots, x_n)$;
- the assignment of some function $r(xi, xj)$, that characterizes the degree of proximity of the i i_ith and j_jth objects.

A similarity measure is a metric if the following conditions hold:

- Symmetry. The distance between objects x_x and y_y must satisfy:

$$d(x,y) = d(y,x) \geq 0, \quad (1)$$

- Triangle inequality. Distance between objects *x, y* and *z*:

$$d(x,y) \leq d(x,z) + d(y,z), \quad (2)$$

- Distinction of non-identical objects. Two objects are given *x* and *y*:

$$d(x,y) \neq 0, x \neq y, \quad (3)$$

- Indistinguishability of identical objects. If *x* and *x'* are identical, then:

$$d(x,x') = 0. \quad (4)$$

Each created cluster is assigned a smaller number of the merging clusters. Iterations are repeated until one cluster is formed.

The arrangement of the collection of objects into relatively homogeneous groups will be carried out with the help of the k-means method:

$$D = \sum_{i=1}^{k} \sum_{x \in S_i} (x - \mu_i)^2, \quad (5)$$

where k is the number of clusters, {\displaystyle S_{i}}; S_i are the obtained clusters, {\displaystyle i = 1,2,\dots ,k}; I = 1, 2, …, k, and μ_i are the centers of mass of all vectors x {\displaystyle x} from the cluster S_i.

The center of mass of all vectors x from the S_i cluster is determined using the distance sorting method and the selection of observations at constant intervals:

$$\mu_i = \frac{1}{S_i} \sum_{x^{(j)} es_i} x^{(j)}. \quad (6)$$

At the next stage, the optimal number of clusters that meet the criterion of maximum approximation of policies for combating crimes against human life and health in the countries within one cluster is according to the following criteria:

- maximization of the Fisher criterion;
- approximation of the probability of rejection of the null hypothesis to the zero value;
- minimization of intragroup variance and maximization of intergroup variance.

The formation of the portrait of each of the formed clusters is employing the one-dimensional CART branching method using the following iterations:

- formalization of the probability criteria for assessing the accuracy of the obtained forecast using the method of the same a priori;
- building a classification tree and choosing its branching options;
- determination of criteria for termination of the branching procedure based on the FACT method;
- determination of the required size of the classification tree using the global cross-validation method.

3. RESULTS AND DISCUSSION

In the first stage, using fixed and random effects models, the relationship between economic and social development indicators of the analyzed countries and the level of crime against human

life and health was analyzed. Then, the crime index was used as an integral indicator reflecting the country's crime and violence level.

The results shown in Table 1 prove the absence of a link between the number of children out of school, the share of government expenditure on education, the level of inflation, the level of tax burden, the International Digital Economy and Society Index, and the level of crime. At the same time, the amount of government expenditure on education and general government expenditure by function, GDP and real minimum wages, the level of trust in institutions, the share of urban population, Gini index, Human Development Index, and Cost of Living Index negatively affect the rate of crime. Thus, an increase in government expenditure on education by 1% leads to a decrease in the crime rate by 0.011%, GDP – by 0.021%, and Human Development Index – by 0.112%. On the other hand, the remaining indicators have a positive effect on the rate of crime in the country.

In general, all determinants explain 96.7% and 98.4% of the variation in the crime rate for fixed-effects and random-effects models, respectively. The F-statistic values for both models (Prob = 0.000) testify to the high statistical significance of the obtained results.

The generalization of the main vectors of economic, institutional, and social policy implementation by the analyzed countries in terms of drivers of change in the level of crime against human life and health made it possible to determine the priority vectors of strategic public management.

Using Data-Mining methods, countries were clustered according to indicators of prevention of violence and crimes against human life and health. The basis of this process was determining the number of clusters into which the analyzed countries should be divided.

To determine the most optimal number of clusters, intergroup and intragroup dispersion were com-

Table 1. Variance analysis for four clusters

Variable	Fixed-effects model				Random-effects model				Link
	Coef.	Std. Error	t-Statistic	Prob.	Coef.	Std. Error	t-Statistic	Prob.	
PRC	0.019	0.003	2.244	0.000	0.043	0.004	5.813	0.000	positive
VV	0.006	0.043	1.946	0.000	0.006	0.055	1.953	0.000	positive
HOC	0.184	0.006	2.656	0.001	0.194	0.006	2.926	0.001	positive
GGE	–0.019	0.008	–2.082	0.000	–0.042	0.008	–5.428	0.000	negative
RTI	–0.015	0.007	–1.436	0.000	–0.023	0.007	–2.526	0.000	negative
PC	0.627	0.009	4.009	0.001	0.852	0.009	31.176	0.001	positive
CC	0.026	0.009	3.117	0.000	0.040	0.009	5.038	0.000	positive
GI	–0.081	0.003	–0.180	0.000	–0.005	0.004	–1.697	0.000	negative
AI10	0.001	0.002	0.078	0.004	0.002	0.002	0.825	0.004	positive
AI20	0.573	0.007	9.443	0.000	0.529	0.007	9.682	0.000	positive
HDI	–0.112	0.001	–1.615	0.000	–0.118	0.001	–1.779	0.000	negative
GEE	–0.011	0.045	–1.266	0.035	–0.026	0.078	–3.301	0.035	negative
PS	0.228	0.007	3.300	0.000	0.821	0.007	13.248	0.000	positive
CLI	0.025	0.003	2.845	0.021	0.228	0.004	28.573	0.021	positive
UP	–0.005	0.009	–1.468	0.010	0.015	0.009	5.186	0.010	negative
COS	0.022	0.064	2.650	0.047	0.051	0.076	6.864	0.053	–
GEE	0.007	0.058	2.298	0.051	0.007	0.081	2.306	0.047	–
INF	0.217	0.085	3.137	0.049	0.229	0.065	3.455	0.054	–
GDP	–0.021	0.014	–2.019	0.008	–0.025	0.014	–2.603	0.008	negative
RMW	–0.032	0.020	–3.743	0.000	–0.054	0.021	–6.786	0.000	negative
TB	0.001	0.059	0.052	0.066	0.002	0.059	0.549	0.048	–
IDECI	0.381	0.060	7.924	0.052	0.352	0.081	9.726	0.051	–
R-Squared			0.967				0.984		
Prob. (F-statistic)			0.000				0.000		

Note: * $p < 0.01$, ** $p < 0.05$, *** $p < 0.1$.

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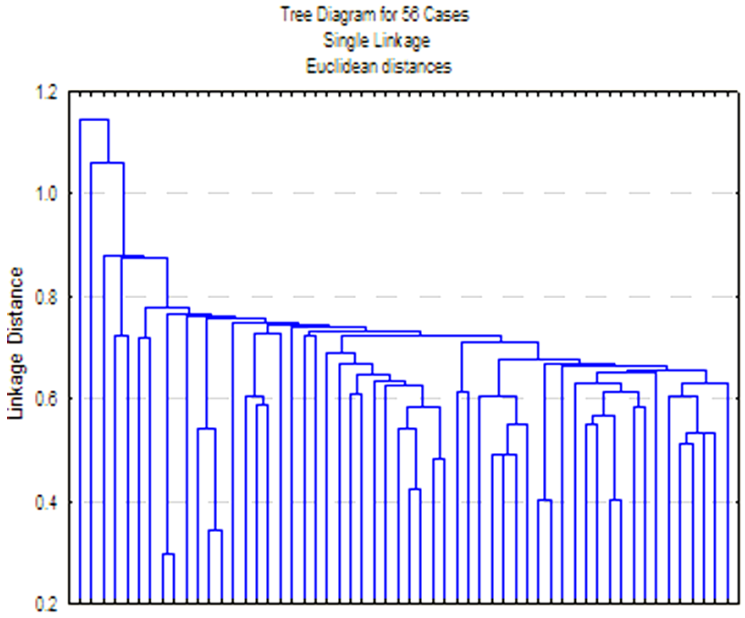

Figure 1. Tree of the hierarchical structure of the distribution of drivers of combating crimes against human life and health

pared for three, four, and five clusters of countries (using the iterative separation method of k-means and tree clustering). The obtained results prove the feasibility of dividing the analyzed countries into four clusters (Figure 1, Table 2).

The parameters of inter-group (Between SS) and intra-group (Within SS) dispersion indicate that the selection of for clusters improves the quality of the grouping of countries since the calculated values of the p-level are lower than the critical (0.05).

The values of intergroup (Between SS) and intra-group (Within SS) dispersion parameters for three clusters of the countries testify to the low quality of the obtained results. For five indicators (PRC, RTI, AI10, AI20, PS, and CLI), the calculated values are significantly higher than the critical val-

Table 2. Dispersion analysis for four clusters

Variable	Analysis of Variance (Spreadsheet2.sta)					
	Between SS	df	Within SS	df	F	p-level
CI	1.330815	3	0.774473	46	34.76736	0
PRC	0.609757	3	0.369925	46	33.35064	0
VV	1.064603	3	1.368985	46	15.73425	0.002354
HOC	0.353338	3	0.954645	46	7.488863	0.001031
GGE	76.93739	3	13.20607	46	117.8757	0
RTI	1.920915	3	1.214390	46	32.00440	0
PC	2.280639	3	1.440984	46	32.02261	0
CC	1.715729	3	1.151391	46	30.14969	0
GI	2.031831	3	1.366417	46	30.08595	0
AI10	2.911699	3	1.253950	46	46.98166	0
AI20	3.244073	3	1.368320	46	47.96954	0
HDI	3.190996	3	1.422938	46	45.37336	0
GEE	1.064556	3	0.645842	46	58.22587	0
PS	0.445146	3	0.737785	46	12.20763	0.000814
CLI	0.465900	3	0.991904	46	9.503488	0.000182
UP	0.763512	3	1.642715	46	9.404035	0.000195
GDP	0.781235	3	1.0024252	46	11.532145	0.000001
RMW	1.424259	3	0.899894	46	19.99812	0

ue – 0.05. In comparison, for indicators VV, HOC, GGE, PC, GI, HDI, GEE, UP, GDP, and RMW, the values are borderline to critical. Moreover, for three and five clusters of the countries, the value of the Fischer test is not statistically significant.

Similar results were obtained for five clusters of the countries. The intragroup and intergroup dispersion, Fisher test, and p-test indicate low statistical significance of the obtained results. However, for a significant number of indicators, the calculated values exceed the critical value (0.05). Thus, the results indicate the feasibility of grouping countries into four clusters.

At the next stage, the criteria for assigning countries to specific clusters were determined depending on the values of the components of the state policy of combating crimes against human life and health (Table 3). The methodological toolkit was the agglomerative methods.

Table 3. Criteria for clustering the countries according to the factors of crimes against human life and health prevention

Variable	Cluster 1	Cluster 2	Cluster 3	Cluster 4
CI	54.09	52.62	42.38	29.99
PRC	37.88	49.50	56.28	67.69
VV	29.13	38.06	43.28	52.05
HOC	31.28	40.87	46.47	55.89
GGE	5.20	6.96	8.60	14.73
RTI	6.13	8.20	9.68	17.30
PC	4.81	6.44	7.60	13.59
CC	5.03	6.74	7.95	14.21
GI	43.78	57.20	65.03	78.22
AI10	12.46	5.77	4.59	5.70
AI20	10.46	4.67	3.67	4.34
HDI	34.08	48.17	59.80	69.54
GEE	4.38	5.86	7.25	12.42
PS	25.96	34.72	42.94	73.61
CLI	22.28	29.81	36.86	63.18
UP	34.07	48.99	65.55	81.05
GDP	3.94E+10	1.48E+11	1.03E+11	1.37E+11
RMW	4772.45	6893.54	8484.36	10605.45

The obtained results show the influence of each factor on the effectiveness of the state policy of reducing the level of crime against human life and health, in particular:

- the average values of crime rate indicators in the first cluster are the highest and consistently decrease from the first to the fourth cluster;
- the average values of the indicators of economic development (GDP, real minimum wages) are the lowest in the first cluster and gradually increase;
- the following features characterize the institutional and financial components of the state policy: the average values of general government expenditure by function (GGE); trust in institutions (RTI); prison capacity and number of persons held (PC); and number of criminal cases processed in first instance courts by the legal status of the court process (CC). They are the lowest in the first cluster;
- indicators of social development (Gini index, inequality-adjusted Human Development Index, government expenditure on education, % of GDP (GEE)); population living in slums, % of urban population (PS); Cost of Living Index (CLI), urban population, % of total population (UP)) are increasing, while the rest of the indicators are decreasing from the first to fourth clusters.

At the next stage, the portraits of each of the four clusters were formalized using the construction of a classification tree (Table 4).

The parameters of the classification tree based on the scenarios of combating crimes against human life and health (Table 3 and Figure 2) allow concluding that the left and right branches of the tree should contain thirteen nodes each (left branch: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26; right branch: 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27). Twenty-six countries belong to the first cluster, thirty-three to the second, twenty-seven to the third, and twenty-seven to the fourth. The distribution of countries by the second and third peaks should be carried out based on the values of the PRC variable. For the countries of the second cluster, its value should not exceed 12.0085, while for the countries of the third cluster, the obtained value should be greater than this value. At the next stage, the decision to assign the country to the fourth cluster is based on the values of the RMW variable, which should be at most 14032.21; otherwise, the country belongs to the third cluster. Further

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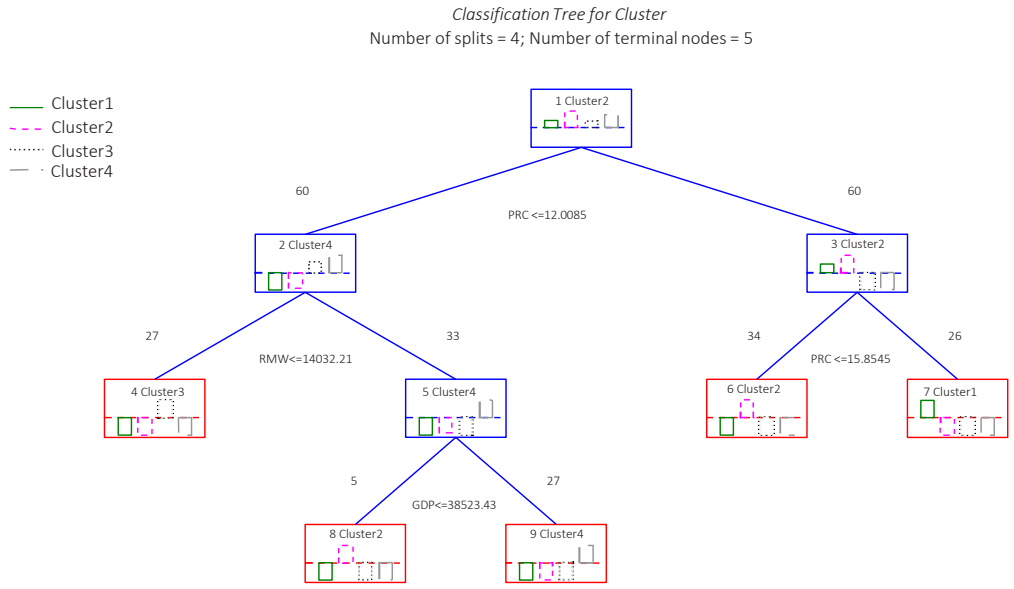

Figure 2. Classification tree according to the scenarios of combating crimes against human life and health

Table 4. Classification tree structure according to the scenarios of combating crimes against human life and health

Node	Left branch	Right Branch	N in cls Cluster1	N in cls Cluster2	N in cls Cluster3	N in cls Cluster4	Predict. Class	Split constant	Split variable
1	2	3	4	8	6	2	Cluster 2	12.0085	PRC
2	4	5	0	1	6	2	Cluster 4	14032.21	RMW
3	6	7	4	6	0	0	Cluster 2	15.8545	PRC
4			0	0	6	0	Cluster 3		
5	8	9	0	1	0	2	Cluster 4	38523.43	GDP
6			0	6	0	0	Cluster 1		
7			4	0	0	0	Cluster 2		
8			0	1	0	0	Cluster 4		
9			0	0	0	2	Cluster 3		

criteria for assigning a country to the second or fourth cluster is the GDP; the limit value is 38523.43. Analyzing the right branch of the classification tree allows for dividing the countries into the second and first clusters. If the value of the PRC is less than 15.8545, the country should be assigned to the second cluster; otherwise, it belongs to the first cluster.

Thus, the first cluster comprises Yemen, Eritrea, Mozambique, Burkina Faso, Sierra Leone, Mali, Burundi, South Sudan, Chad, Central African Republic, Nigeria, Aruba, Kosovo, Nauru, Somalia, and Tuvalu. The stability of the analyzed indicators (standard deviation, coefficient of variation, maximum and minimum values) is analyzed in Table 5.

Table 5. Descriptive statistics for the first cluster from 2011 to 2020

Variable	Mean	Std. Dev.	Min	Max
CI	54.09	10.81665	42.08	63.28
PRC	37.88413	7.24055	28.61466	48.94181
VV	29.13191	5.567794	22.00393	37.63498
HOC	31.27871	5.978097	23.62545	40.40838
GGE	5.201259	1.92532	1.691083	7.871265
RTI	6.129164	2.268797	1.992772	9.275499
PC	4.813845	1.781913	1.565123	7.284977
CC	5.034495	1.863589	1.636863	7.618895
GI	43.77644	8.366709	33.06525	56.55398
AI10	12.4642	0.49446	11.72	13.2
AI20	10.4642	0.49446	9.72	11.2
HDI	34.08053	6.513592	25.74173	44.02801
GEE	4.380192	1.62139	1.424129	6.628713
PS	25.95669	9.608237	8.439286	39.28126
CLI	22.28042	8.247414	7.244022	33.71782
UP	34.06554	6.510726	25.7304	44.00864
GDP	3.94e+10	1.13e+11	3.68e+07	5.47e+11
RMW	4772.453	1456.985	2885.67	8676.216

The second cluster includes the Maldives, Tunisia, Mongolia, Botswana, Paraguay, Uzbekistan, Bolivia, Indonesia, the Philippines, Turkmenistan, Venezuela, South Africa, Egypt, Vietnam, Kyrgyzstan, Morocco, El Salvador, Tajikistan, Ghana, Nepal, Kenya, and Cambodia. Descriptive statistics of these countries are given in Table 6.

Table 6. Descriptive statistics for the second cluster from 2011 to 2020

Variable	Mean	Std. Dev.	Min	Max
CI	52.6215	12.08849	33.76	83.58
PRC	49.49671	18.3219	16.09284	74.90526
VV	38.06167	14.08907	12.37497	57.60019
HOC	40.86653	15.12732	13.28691	61.84488
GGE	6.958243	1.598484	4.46415	11.05194
RTI	8.199941	1.883734	5.260778	13.02416
PC	6.440234	1.479485	4.131815	10.22918
CC	6.735432	1.547299	4.321203	10.69805
GI	57.19518	21.1716	18.59584	86.55565
AI10	5.77	0.30219	5	6.15
AI20	4.66846	0.13521	4.48	4.88
HDI	48.16842	17.83022	15.66097	72.89511
GEE	5.859819	1.346149	3.759443	9.307293
PS	34.72486	7.977178	22.27818	55.15433
CLI	29.80674	6.847363	19.1229	47.34277
UP	48.99489	18.13615	15.92968	74.14584
GDP	1.48e+11	2.29e+11	2.77e+09	1.19e+12
RMW	6893.543	2104.534	4168.19	12532.31

The third cluster consists of Saudi Arabia, Chile, Qatar, Argentina, Brunei, Montenegro, Palau, Kazakhstan, Turkey, Uruguay, Panama, the Bahamas, Barbados, Oman, Georgia, Costa Rica, and Malaysia (Table 7).

Table 7. Descriptive statistics for the third cluster from 2011 to 2020

Variable	Mean	Std. Dev.	Min	Max
CI	42.38312	15.68871	13.78	64.14
PRC	56.28062	12.92908	36.10755	89.39186
VV	43.27832	9.942126	27.76577	68.74001
HOC	46.4676	10.67478	29.81189	73.80562
GGE	8.604329	1.720651	6.693846	10.06622
RTI	9.677719	1.935302	7.528904	11.32198
PC	7.60088	1.519986	5.913201	8.892285
CC	7.949278	1.589657	6.184241	9.299876
GI	65.03422	14.94001	41.72354	103.2954
AI10	4.59	0.14101	4.41	4.91
AI20	3.66615	0.08884	3.4	3.77
HDI	59.80433	13.73857	38.36824	94.98867
GEE	7.246055	1.44903	5.637161	8.477175
PS	42.93959	8.586846	33.4054	50.23511
CLI	36.85802	7.370683	28.67416	43.12027
UP	65.54534	15.05742	42.05146	104.1072
GDP	1.03E+11	1.11E+11	1.72E+10	5.06E+11
RMW	8484.36	2590.196	5130.08	15424.38

Finally, the fourth cluster includes Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia (Table 8).

Table 8. Descriptive statistics for the fourth cluster from 2011 to 2020

Variable	Mean	Std. Dev.	Min	Max
CI	29.98727	5.731273	22.65	38.74
PRC	67.69259	13.53683	52.6623	79.19369
VV	52.05383	10.40947	40.49594	60.89788
HOC	55.8898	11.17656	43.48017	65.38558
GGE	14.72892	2.815043	11.12505	19.02802
RTI	17.30353	3.307112	13.06971	22.35411
PC	13.59019	2.597406	10.26495	17.55692
CC	14.21312	2.716462	10.73546	18.36167
GI	78.22115	15.64228	60.85314	91.51108
AI10	5.69769	0.0871	5.58	5.83
AI20	4.34077	0.23432	3.82	4.52
HDI	69.54351	13.90697	54.10226	81.3591
GEE	12.42139	2.374021	9.382134	16.04697
PS	73.60826	14.06827	55.59783	95.09315
CLI	63.18306	12.07577	47.72346	81.62503
UP	81.05116	16.20821	63.05478	94.82192
GDP	1.37e+11	1.48e+11	2.29e+10	6.74e+11
RMW	10605.45	3237.745	6412.6	19280.48

The rest countries cannot be clearly assigned to a specific cluster. The obtained results make it possible to determine the peculiarities of the policy of combating crimes against human life and health depending on the country's membership in a particular cluster:

- the policy of strict administrative restrictions – a policy aimed at reducing the rate of crime against human life and health in the country by increasing criminal and administrative responsibility for committed actions;
- the policy of economic stimulation – a set of measures of an economic nature to increase the level of material well-being of the population and its standard of living, thus stimulating it to refuse to participate in criminal activities;
- social security policy – a system of socio-economic measures aimed at the material support of the population and its protection from social risks.

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Thus, the study results confirmed the hypothesis that in countries with a higher level of economic and social development, the rate of crime against human life and health is lower. These results are consistent with Sugiharti et al. (2022), Kelly (2000), Mukherjee (2019), Enamorado et al. (2016), Li et al. (2019), and Klochko et al. (2020).

This study confirms the validity of the approaches that the level of crime in the country depends on specific components of state policy. At the same time, it disagrees with Zaman (2018), Roman (2013), Khan et al. (2015), and Pierskalla (2016) regarding the expediency of taking into account the influence of individual state policy components separately from each other. According to the findings, the level of crime against human life and health has a complex impact on the analyzed countries' economic, social, and institutional development.

At the same time, despite this study's contribution to reforming the crime against human life and health prevention policy, this study has certain shortcomings that can be considered in future studies.

Firstly, the lack of a data set for a separate group of countries of the world, on the one hand, and the importance of solving the problem of a high level of crime against human life and health in the world, on the other hand, actualized the analysis a larger number of countries in future studies. Secondly, the number of drivers for forming the state policy of preventing crimes against human life and health should be increased. In addition, this study did not consider the sensitivity of crime against human life and health rate to the implemented measures. The formation of state policy should be based on the results of assessing the impact of specific indicators on the clustering results.

CONCLUSION

This study is devoted to assessing the impact of institutional, economic, and social components of state policy on the level of violence and crime against human live and health.

Fixed and random effects models were used to analyze the link between institutional, economic, and social development indicators and the level of crime against human life and health. The study proved a correlation between the rate of crime and most of the analyzed indicators: an increase in government expenditure on education by 1% leads to a decrease in the crime rate by 0.011%, GDP – by 0.021%, and Human Development Index – by 0.112%. At the same time, there is no statistically significant influence of the number of children out of school, the share of government expenditure on education, the level of inflation, the level of tax burden, and the International Digital Economy and Society Index on the rate of crime.

Thus, the obtained results indicate the necessity to assess the level of individual components of state policy in developing a methodological toolkit for crime against human life and health prevention. The basis of this process should be clustering depending on the values of the most influential drivers of changes in the crime level against the population's life and health. According to the clustering results, four clusters were selected – groups of 16, 22, 17, and 11 countries, respectively.

It is concluded that there is a need for an appropriate government policy to neutralize its growth factors' negative impact within the framework of institutional, economic, and social components. The choice between types of policies to reduce the rate of crime against human life and health (the policy of strict administrative restrictions, the policy of economic stimulation, and the policy of social security) should take into account the country's membership in particular cluster, the direction of its state policy, the potential of transition to a cluster with lower crime rates, and the significance of institutional, economic and social components of its policy.

AUTHOR CONTRIBUTIONS

Conceptualization: Zamina Aliyeva.
Data curation: Zamina Aliyeva.
Formal analysis: Zamina Aliyeva.
Funding acquisition: Zamina Aliyeva.
Investigation: Zamina Aliyeva.
Methodology: Zamina Aliyeva.
Project administration: Zamina Aliyeva.
Resources: Zamina Aliyeva.
Software: Zamina Aliyeva.
Supervision: Zamina Aliyeva.
Validation: Zamina Aliyeva.
Visualization: Zamina Aliyeva.
Writing – original draft: Zamina Aliyeva.
Writing – review & editing: Zamina Aliyeva.

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