REGIONAL DISPARITIES AND THEIR CONNECTION WITH JUVENILE DELINQUENCY

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Abstract

The purpose of this study is, firstly, to analyze the causes of juvenile delinquency in 26 regions of Turkey and to reveal a profile by grouping the statistical regions with respect to their diversities and similarities, and then, secondly, to confirm the obtained groups by discriminant analysis. The Turkish government defined 26 statistical regions, in accordance with the harmonization process, as modeled by the EU. As a result of the cluster analysis, the difference between the regions appeared in two groups. These groups are confirmed by using discriminant analysis. According to the cluster analysis results, it is surprisingly observed that there is no significant difference among undeveloped, developing and developed regions, and these regions are mixed in the clusters. In fact, it was initially not expected that parents living in developed regions, with high economic and education levels, would be so ineffective in preventing children from being pushed into crime.

Keywords: *Juvenile delinquency, Children driven into crime, Cluster analysis, Discriminant analysis, Social cohesion.*

BÖLGESEL FARKLILIKLAR VE ÇOCUK SUÇU İLE İLİŞKİSİ

Öz

Bu çalışmada amaç, Türkiye'de suça sürüklenen çocukların suça sürüklenme nedenlerini, bölgesel farklılıkları göz önünde bulundurarak analiz etmek ve varsa ortak özellikleri olan bölgeleri bir araya getirerek Türkiye'nin suça sürüklenen çocukları bakımından bir profilini ortaya çıkarmaktır. Çalışmada Türkiye'nin Düzey 2 istatistiki bölgesel birimleri olarak ayrılan 26 bölge temel alınmıştır. Yapılan kümeleme analizi sonucunda, bölgeler arasında farklılık iki grup olarak ortaya çıkmıştır. Gruplandırmada, ebeveynlerin iş ve istihdam oranı ve eğitim düzeyinin yüksek olarak bilindiği, çocukların ise eğitime ve sosyal faaliyetlere ulaşma olanaklarının daha fazla olduğu gelişmiş bölgeler ile bu olanaklardan daha az yararlanabilen veya hiç yararlanamayan bölgeler arasında farklılığın olmaması oldukça dikkat çekicidir. Çalışmada elde edilen iki grubun farklılığı, diskriminant analizi ile teyit edilmiştir. Ülke profilini yansıtan farklılığın, iki grup olarak ortaya çıkması diğer bir deyişle çeşitliliğin az olması, ortak programın hazırlanmasından uygulanmasına kadar pek çok aşamada kolaylık getirecek bir unsur olarak değerlendirilebilir.

Anahtar kelimeler: *Çocuk suçları, Suça sürüklenen çocuklar, Kümeleme analizi, Diskriminant analizi, Sosyal uyum.*

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1. INTRODUCTION

Juvenile delinquency is a significant problem that can be encountered in all countries, without regard to economic development levels. Based on an understanding of the welfare state and its provisions, it is the duty of relevant institutions and all officials to help children develop age-appropriate habits and behaviors. Regarding this aim, very important precautions must be taken for children to adapt to society. These precautions include preventing abnormal attitudes, reducing indulgence, and providing support.

Keeping children away from criminal behaviors by directing them to positive behaviors can be achieved by the contributions of not only the family but also the school and social environment. Children who develop and respect the norms are prevented from participating in unacceptable activities. However, when this balance, which is crucial for children, cannot be achieved, children can easily get caught up in unwanted behaviors.

Juvenile delinquency is one of the most important problems of the century. In nearly every corner of the world, we are observing that children, who make up the most vulnerable group in society, can be the target of malicious people who, to pursue their own interests, draw them into actions that constitute criminal offenses. As social circumstances favor an increase in juvenile delinquency, the problem becomes much more complex, both in terms of combating this negative social phenomenon, and in terms of annulling the harmful consequences arising from the commission of a criminal offense. Therefore, when we consider juvenile delinquency, we are aware that it is a multi-layered phenomenon. It is understood that the child, as the weakest individual of a society, should be protected by legal rules. Currently, change is occurring rapidly in all levels of society and new strategies and regulations are needed to protect children and their development. These strategies must also take into consideration each child's individual needs. Regional differences also need to be examined. A balance needs to be reached between reducing the rate of juvenile delinquency and focusing on the needs of a healthy child's upbringing. This balance should include not only the family, but also other contributors in the community. Implementing these strategies in various contexts acts as a safeguard, protecting the concept of childhood from disappearing due to social consciousness resulting from children committing serious crimes.

1.1. The Connection between Child and Crime

Globally, it is accepted that children, an important resource in determining the future and development of societies, are the most valuable assets of society. Children are the future for humanity, the continuation of family lines, and will be a new generation of educators (Imamoglu, 2015). As children move towards fulfilling these roles in society, they must distance themselves from crime. The term crime can be defined as an act that is prohibited and punishable under criminal law (Hakeri, 2016). Children and criminal activity should not be closely connected, and yet this is the reality. Legally, there are various statements and conventions that define who is a child and how to treat a child in regards to criminal activity. One example is the Convention on the Rights of the Child, prepared and adopted by the United Nations, which states, "every individual under the age of eighteen is considered a child" (UNCRC, 1992). In addition, the United Nations (UN) Minimum Standards Rules, known as the "Beijing Rules" and adopted on September 6, 1985, define the "juvenile, in the legal system, as a person who has to be treated differently than an adult because of a crime he may commit". The Beijing Rules play an important role in the judicial and law enforcement system which addresses children pulled into crime. They adopt new law practices that are relevant and explore different disciplinary evaluations of this issue (Bulbul and Dogan, 2016). Turkey, as of 1990, is a participant in the Beijing Rules. They uphold the same standard: that any individual under the age of 18 is a child. According to Bulbul and Dogan, a child is defined as *the entity that has not reached mental, physical and spiritual maturity, has yet to learn its roles and duties in society, and needs care and education* (2016). In Turkey, children's education, health, and social aspects are guaranteed by the many institutions of the state (Copur et al., 2015). It should be stated, however, that the family has very important responsibilities within the society to support children. Parents are obligated to create environments where children can develop morality and healthy behaviors and habits, so that they will not be interested in crime. We must acknowledge that children can commit crimes like adults do, but we must also strongly argue that they have different reasons and circumstances influencing their behaviors.

1. 2. Contributing Factors to Juvenile Delinquency

Yavuzer (2019) argues that there is "no guilty child, just a child pushed into crime". Children are innocent and unaware of the factors and influences that may lead them into crime. It is not possible to prevent children from being involved in crime without recognizing and investigating these factors. In addition to three basic factors - personal, familial, and environmental - socio-economic characteristics are also of great importance. Children that do not adapt socially experience social incompetence, which is reflected in their behaviors and pushes them towards juvenile delinquency (Afsin and Ogretir Ozcelik, 2018).

Certain circumstances or events, such as war and post-war circumstances, strained social relations, economic instability, poverty, unemployment, housing and financial difficulties, refugee crises, moral deterioration, broken value systems, and family breakdowns are particularly conducive in producing delinquent behavior. Juvenile delinquency is a product of troubles, dissatisfaction, crises, problems, and hopelessness in young people. As adolescents face these circumstances, it must be emphasized that they are the most vulnerable population group for the development and adoption of addictive behavior. Therefore, we observe some adolescents abusing psycho-active substances and drugs, which is a form of delinquent behavior. Meanwhile, other adolescents respond to these situations by having fragmented knowledge, incorrectly adopted information, illusions of invulnerability, and lack of communication skills. It is necessary to examine all of the potential reasons a child may develop delinquent behaviors.

2. BACKGROUND

There are a number of studies which explore the role of various factors that contribute to crime. Gershoff's study (2002) stressed the negative impacts of physical punishment by parents. Another study done by Petrosina et al. (2009) indicated that family dynamics are a factor that is strongly correlated with onset and recidivism of juveniles. Similarly, Mwangangi (2019) found that several specific aspects of family life such as family cohesion, physical violence, and parent involvement, as well as non-family factors such as poverty, the juvenile justice system, a lack of access to education, drug abuse and genetic problems, all influence a child's involvement in crime. Although there are different factors that have the impact on juvenile delinquency, the role of the family is central in a child's rearing and development.

On the other hand, Derzon (2010) stated that violence and all antisocial behavior spring from many sources. He discovered a modest correlation between most family features and antisocial behaviors using data obtained from all developed western nations. Family-based programs, although not the only solution, are likely to reduce antisocial behaviors in children. These programs can be effective in addressing and improving child-rearing skills, discipline, home stability, supervision, involvement, warmth, and relationship. Other researchers, Afsin et al.(2019) compared two groups of children of the same age, one which included delinquents and another consisting of non-delinquents. These two groups were compared in terms of their perceptions and attitudes towards their mother and father and their attachment styles. They employed nonparametric statistical analysis techniques, specifically the Mann-Whitney U test and Kruskal-Wallis test, in their studies. According to their results, it is revealed that there are statistically significant differences between delinquent and non-delinquent adolescents in their perceptions and response to parental styles and attachment.

Other researchers argued that some additional factors are likely to contribute to juvenile delinquency. Copur et al. (2015) have focused attention on the impact of society and the environment on the child. They pointed out that healthy and happy societies exist as children move away from crime and as society as a whole finds the solution to this problem. In line with the regulations made at the central government level, local administrations and other relevant public institutions should contribute to the protection of children by fighting crime and criminals, while also taking into account the social structure and environment in their areas of duty and responsibility. However, measures taken at the central government level and resulting legal regulations are not sufficient alone in the prevention of juvenile delinquency.

Most of the aforementioned studies are based on questionnaire surveys or meta-analysis to obtain valuable information. However, in this study, secondary data obtained from the Turkish Statistical Institute (TurkStat) was

employed using cluster analysis to reveal regional differences and similarities in terms of juvenile delinquency. The aim of this research is to obtain a general and regional profile of the country, to provide additional information to policymakers and leaders who are developing strategies and plans for addressing this issue in the future. The difference of this study from other studies is that it presents the profile of a specific country (Turkey) to aid local and central administrators in combating juvenile crime.

3. DATA and METHODOLOGY

3. 1. Data

In this study, data about children pushed to crime is obtained from official records obtained from website of TurkStat. Children who have committed a crime or are accused of committing a crime are registered and categorized under 15 headings. In this way, information is available in the database to meet the needs of researchers. Information for this study was collected from under the heading of *reasons for children being driven into crime*, and under the subheading of *security and justice*.

In the database, each type of crime is categorized by the reason juveniles were brought to security units. These 15 reasons for registering children are considered as variables in this study and their explanations are given below in Table 1.

Table 1. The variables and their explanations

Variables	Explanation
Witness	A child who has some knowledge about an investigated subject and is giving a statement or declaration.
Foundling	A child who is received into a security unit after being found by a security member or a citizen. There is not a document or statement that declares formally that the child is missing.
Escapee from home	A child who is saying that "I escaped from home" when found.
Committing a misdemeanor	A child who has committed unacceptable behavior which requires administrative sanction.
Illegal worker	A child who works/is employed in a position which violates the pre-specified procedures and principles in the working conditions governed by laws.
Lost but found	A child who is received into security after being found and for whom there is a formal missing application.
Fleeing	A child who flees the law.
Drug usage	A child is brought to the security unit with suspicion or evidence of usage of natural, synthetic and/or chemical substances which alter mental-cognitive activities and psychological behaviors.
Victim	A child who is damaged from an act which is accepted as an offence according to the law.
Disrupting education	A child who is at an age at which school is required and is out of school because of poverty or various troubles in their families and social environments.
Working on the street	A child who works on the street to contribute to the family's budget or to cover his/her expenses.
Living on the street	A child who lives in poverty on the street without any vital support.
Delinquency	A child who is pushed into crime or under suspicion from a person about committing a crime or allegation.
Abandoned	A child who is left in a state of vulnerability and needs legal representation.
Other	A child in who is taken in for other reasons not listed above.

Source: Table is organized using published reports from TurkStat (2012).

Statistical regions are divided according to the European Union (EU) harmonization process. The members and candidate states of the EU have established their database with a similar database structure. As a result of EU harmonization efforts, TurkStat presented three statistical regions, named as Level 1, Level 2 and Level 3 in Turkey.

Statistical regional units are defined as subcategorization of the regions or provinces with consideration to their geographical, economic and socio-cultural characteristics. Within these subcategories, detailed analysis and comparisons can be made. For instance, analysis can be used to develop and implement regional policies, to define common policies or programs in similar regions, and to make a comparison among the regions or with regions of EU countries. Table 2 shows a list of the specific provinces in each statistical regions. Level 3 consists of 81 provinces in Turkey and is not included in this study.

Table 2. Level 2 statistical regions and related provinces

No	Region Code	Provinces in the Region	No	Region Code	Provinces in the Region
1	TR10	İstanbul	14	TR71	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir
2	TR21	Tekirdağ, Edirne, Kırklareli	15	TR72	Kayseri, Sivas, Yozgat
3	TR22	Balıkesir, Çanakkale	16	TR81	Zonguldak, Karabük, Bartın
4	TR31	İzmir	17	TR82	Kastamonu, Çankırı, Sinop
5	TR32	Aydın, Denizli, Muğla	18	TR83	Samsun, Tokat, Çorum, Amasya
6	TR33	Manisa, Afyonkarahisar, Kütahya, Uşak	19	TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane
7	TR41	Bursa, Eskişehir, Bilecik	20	TRA1	Erzurum, Erzincan, Bayburt
8	TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova	21	TRA2	Ağrı, Kars, Iğdır, Ardahan
9	TR51	Ankara	22	TRB1	Malatya, Elazığ, Bingöl, Tunceli
10	TR52	Konya, Karaman	23	TRB2	Van, Muş, Bitlis, Hakkari
11	TR61	Antalya, Isparta, Burdur	24	TRC1	Gaziantep, Adıyaman, Kilis
12	TR62	Adana, Mersin	25	TRC2	Şanlıurfa, Diyarbakır
13	TR63	Hatay, K. Maraş, Osmaniye	26	TRC3	Mardin, Batman, Şırnak, Siirt

Source: Website of TurkStat

In Figure 1, it is observed that 26 statistical regions are divided into 6 different economic development levels. While number 1 represents the most developed regions, number 6 shows the least developed areas. The most economically developed regions are shown with lighter colors, while the darker colors show the areas with worse levels of economic development.
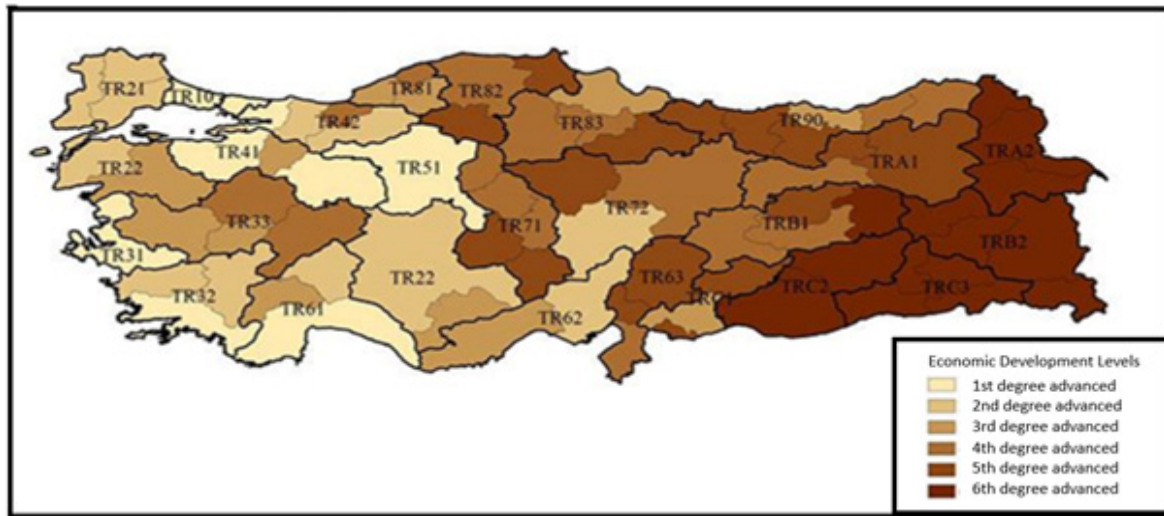

Figure 1. Economic development levels of 26 statistical regions

Source: Regional Administration and Local Democracy[1]

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1 https://yereldemokrasi.net/haritalarla-kamu-idaresi

In this study, in order to differentiate the similarities and differences between the regions in terms of the children who were pushed into the crime, the regions in Level 2 were the basis of our research. In the TurkStat database, only data from the years 2008-2017 were available for the topic of juvenile criminals. Due to the data constraint, 2017 is the most current year of data used in this analysis.

In Figure 2, the changes in the total numbers of juveniles pushed to crime is shown by the years. In line with our expectations, 2008 is seen as the year with the highest numbers of crime. In the following years, this problem has increased even more. The figure shows that there was a striking improvement in all regions in 2016, but this improvement dissipated in 2017. The regions TR10 and TR31, which include highly developed provinces such as Istanbul and Izmir, have the worst score among the regions for all years. Similarly, TR33, TR51 and TR83 also have bad scores. On the other hand, TR81, TRC3, TR82, TRA1 and TRA2 are the regions that have the best scores for all years when compared with the remaining regions. Consequently, we can state that:

i)   General characteristics of the regions remain the same when compared year by year.

ii) Although the high crime levels in 2008 seem to have decreased notably by 2016, it is observed that the number of juveniles pushed into crime increased again in 2017.
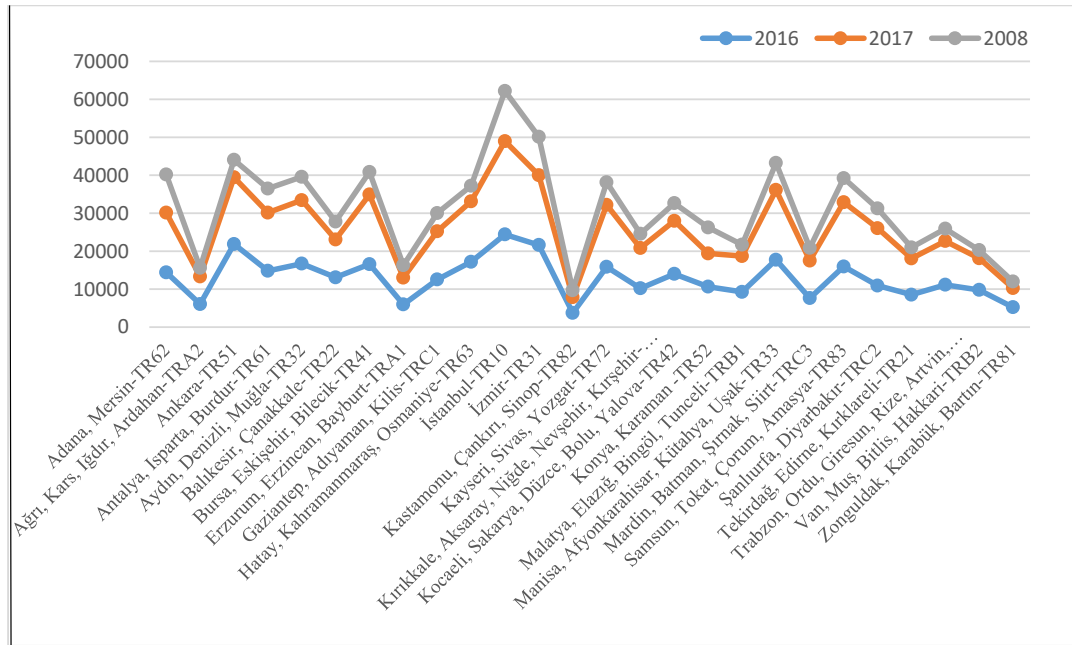

Figure 2. The changes in juvenile crime by years

After organizing data in a fitting manner, cluster analysis was first performed on data to provide useful information and then the reliability of the obtained clusters was tested by discriminant analysis.

These two types of analysis resemble each other in the context of cluster categorization. Cluster analysis is a process of determining groups if they exist. Discriminant analysis builds on this and requires knowing the groupings before performing analysis.

In this study, cluster analysis is achieved by considering the causes of juvenile pushed to crime and it reveals the similarities or differences of 26 statistical regions in Turkey. Secondly, heterogeneous subgroups obtained by cluster analysis are tested by discriminant analysis in order to determine whether there is a statistically significant difference between/among them. That is a way to obtain further evidence to support the obtained results from the initial cluster analysis.

3. 2. Cluster Analysis

Organizing the data into logical groupings is one of the most fundamental modes of understanding and learning (Jain, 2010). In order to obtain possible groups within the immense data, statistical package computer programs can be employed. Cluster analysis is a well-known statistical analysis for grouping objects meaningfully. It is used to get information about real situations while avoiding the subjectivity. Obtained information can be used to make better and rational decisions (Everitt et al. 2011). Cluster analysis is a highly efficient analysis used to categorize a set of similar objects and therefore it is the preferred form of analysis used to categorize the 26 statistical regions of Turkey in this study.

Cluster analysis is a statistical analysis method that groups objects according to their similarities or differences in terms of selected variables. These groups are also referred to as clusters. Variables are considered as features or criteria for grouping objects. Objects that are similar to each other in terms of the variables are located in the same cluster, while dissimilar objects are collected into other clusters.

Cluster analysis seeks to maximize the homogeneity of objects within the same cluster and the heterogeneity between different clusters while grouping (Karagoz, 2017: 411). In this way, a large and complex data set is grouped according to the specified features and transformed into a form where more simple and clear classification can be obtained (Everitt et al. 2011).

Although there are many methods in cluster analysis in the literature, hierarchical cluster and non-hierarchical cluster methods are the most common. In the hierarchical cluster method, the number of clusters is not determined by the user, but the best cluster number is determined by the dendrogram (tree diagram) which is presented by the system automatically. An analyst can therefore have a general idea, but a cluster number from a dendrogram is not always accurate. However, in a non-hierarchical cluster analysis, the number of clusters is initially defined by the analyst and then applied.

Experts who are familiar with a subject may wish to test different numbers of clusters that they want to analyze separately. In this case, they have to use "non-hierarchical cluster analysis". In addition, cluster similarities or differences can be examined and discussed by using the information provided by non-hierarchical cluster analysis about clustering operations. However, these operations are not possible in the hierarchical clustering method. Although the hierarchical cluster method is easy to apply and interpret, it is a less trusted method (Kalaycı, 2008).

According to the algorithm of the hierarchical cluster method, a distance matrix is created with the help of a distance measurement, and by using this matrix, the closest objects are connected together. A dendrogram is created by showing all objects together according to their proximity to each other. Dendrograms can be used to get information quickly about the number of clusters present within the data (Kalaycı, 2008).

In this study, grouping was examined by using both cluster methods. The aim is to interpret the various findings obtained and to determine the best cluster number which reflects the accurate number of clusters in relation to the reasons of the delinquencies. This method will also determine effectively which regions belong to which cluster.

However, for the relatively current data of 2017, the consistency of different groups obtained in cluster analysis was examined and confirmed for accuracy by discriminant analysis. According to the result of the discriminant analysis, there is a statistically significant difference between the two heterogeneous subgroups obtained by cluster analysis.

3. 3. Discriminant Analysis

In the study, discriminant analysis is utilized to answer some of the questions about *whether the groups are substantially different* or *what variables are most effective in the separation of the groups* or *how many groups there are*.

The objective of discriminant analysis is to determine the discriminant function. Discriminant function is a multivariable linear function composed of more than one independent variable and only one dependent variable. The dependent variable is binary or categorical while independent variables are not. When the dependent variable has two groups, it can be in the binary form. Otherwise, for more than two groups, the dependent variable must be a categorical variable. With a categorical dependent variable, the linear combination of independent variables in the discriminant analysis provides the capability to discriminate between the groups. Discriminant analysis also enables researchers to verify whether substantial differences exist between groups by evaluating the model summary. When a discriminant function is statistically significant, the coefficients of the function representing the contribution of the relevant variable is assumed to be reliable and meaningful and produced classification table showing the accuracy percentage of each groups can be reliably interpreted.

In discriminant analysis, the number of discriminated groups are directly related with the number of produced discriminant functions. When a dependent variable has two groups, groups are derived from only one discriminant function. On the other hand, for more than two categories, more than one discriminant function can be produced to predict the correct groups.

The main steps included in the discriminant analysis are as follows:

• The problem is determined and data are arranged in order of necessity according to the analysis.

• The discriminant function and coefficients are estimated.

• The significance of these discriminant functions are statistically checked.

• Before interpreting the results, the validity of estimated discriminant function and coefficients is verified.

When the discriminant function and its coefficient are significant and valid, the result of analysis can be interpreted reliably.

4. FINDINGS

First of all, a hierarchical cluster algorithm is applied to give the potential number of clusters to the analyst by the means of dendrogram. A dendrogram is used to visualize the history of the grouping process and determine the optimum cluster number. To obtain the cluster numbers, the following steps are performed in order (Maklin, 2018):

1. Determine the largest vertical distance that doesn't intersect any of the other clusters

2. Draw a horizontal line at both extremities on the determined vertical lines.

3. The optimal number of clusters is equal to the number of vertical lines going through the horizontal line.

Using these steps, 2 groups are obtained for data belonging to 2008, as is evident on the left side of Figure 3. Figure 3 shows that the number of groups is not high and there exists less regional diversity in Turkey in terms of juvenile crime. This finding surprisingly reveals that some economically developed and less developed regions are located in the same group, such as TR10 (Istanbul) and TRC2 (Sanlıurfa, Diyarbakır) in group 1. Similarly TR22 and TRB1 are placed in group 2. In the study, SPSS 21.0 software package program has been used in the statistical analysis.

The groups obtained with this dendrogram are checked by using non-hierarchical cluster analysis. Non-hierarchical cluster analysis aims to find a grouping of objects which maximizes or minimizes some evaluating criterion. Many of these algorithms are iterative. This analysis assigns the objects to different groups while searching for some optimal value in the criterion. At the beginning of analysis, cluster number k must be defined and input. For the year 2017, the right side dendrogram in Figure 3 also shows 2 groups including different regions from the left side dendrogram.
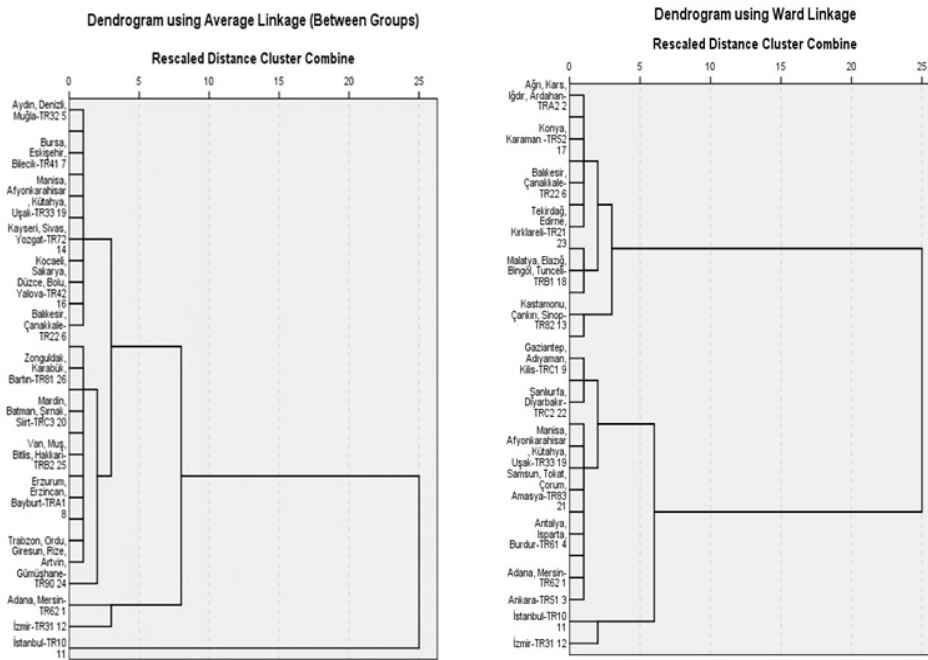
Figure 3. Dendrogram related to juvenile delinquency in the years 2008 and 2017

One of the necessary conditions for defining the number of clusters is that there cannot exist large differences between the numbers of members in the groups. Although the number of objects in the clusters is not necessarily equal, there should not be a large difference between the numbers of objects (Kalaycı, 2008). Determining the number of clusters is one of the most difficult problems in cluster analysis. However, the uncertainty in each of the individual clusters in hierarchical cluster analysis can also be examined using other techniques (Everitt et al. 2011:268).

In order to find the optimum and most logical cluster numbers, cluster analysis is run many times with different member sizes, *k* (Kalaycı 2008; Jain 2010). For the earliest (2008) and most recent year (2017), this method is performed and the cluster number *k* is obtained as 2 for both years. For this purpose, non-hierarchical analysis is employed with the k-nearest algorithm. The results for the year 2008 with different *k* numbers are shown in Table 3, which includes group numbers and the number of objects in each group. As observed in Table 3, the optimum group (cluster) number is 2. Therefore, the final cluster centers for 2008 are demonstrated in Table 3.

Since it is not be possible to show all the results of analysis and their related tables, the analysis results for the years 2008 and 2017 will be predominantly discussed from now onward, in the study. By this means, the difference between the old and the new period can be clearly revealed.

Table 3. Distribution of regions for the year 2008 using non-hierarchical analysis

Group numbers	Groups members				Total regions
	1	2	3	4	
k=2	3	23	X	X	26
k=3	8	17	1	X	26
k=4	11	12	2	1	26

Using Table 4, we can state that the children in Cluster 1 were pulled into crime more than Cluster 2 in the year 2008 because Cluster 1 has greater final cluster centers than Cluster 2.

Table 4. Final cluster centers for the year 2008

Variables	Clusters	
	1	2
Witness2008	78	95
Foundling2008	162	37
Other2008	780	322
EscapeFromHome2008	237	74
CommitingAMisdemeanor2008	63	45
IllegalWorker2008	490	132
LostButFound2008	39	13
Fleeing2008	26	4
DrugUsage2008	2376	1610
Victim2008	0	1
DisruptingEducation2008	1071	18
WorkingOnTheStreet2008	5	0
LivingOnTheStreet207	5755	1964
Deliquency2008	8	3
Abandoned2008	53	44

This difference is also reflected in the greater distances between two clusters. The regions in these two clusters are demonstrated in Table 5. According to Table 5, TR62, TR10 and TR31 are the only regions in Cluster 1. Regarding juvenile delinquency, the regions are similar to each other. A common feature of these regions is that they receive a lot of immigration. Interprovincial migration in Turkey is the movement of people from one province to another with the intention of finding work. The Adana, Mersin, İstanbul and İzmir provinces are well-known and highly preferred provinces. Other economically developed provinces in regions TR22 (Balıkesir), TR41 (Bursa) and TR51 (Ankara) are located in the Cluster 2, like some of the developing provinces in TRB2 (Hakkari) and TRC2 (Şanlıurfa) regions. Within this analysis, it is observed in 2008 that in economically developed regions, juvenile delinquency appears to be higher.

Table 5. Cluster membership for the year 2008

Region No	Regions	Clusters	Distance
1	Adana, Mersin-TR62	1	1316.781
2	Ağrı, Kars, Iğdır, Ardahan-TRA2	2	1132.835
3	Ankara-TR51	2	590.764
4	Antalya, Isparta, Burdur-TR61	2	986.868
5	Aydın, Denizli, Muğla-TR32	2	1468.059
6	Balıkesir, Çanakkale-TR22	2	990.457
7	Bursa, Eskişehir, Bilecik-TR41	2	1021.974
8	Erzurum, Erzincan, Bayburt-TRA1	2	925.047
9	Gaziantep, Adıyaman, Kilis-TRC1	2	273.991
10	Hatay, K. Maraş, Osmaniye-TR63	2	660.97
11	İstanbul-TR10	1	2727.301
12	İzmir-TR31	1	1907.581
13	Kastamonu, Çankırı, Sinop-TR82	2	1596.369
14	Kayseri, Sivas, Yozgat-TR72	2	1164.61
15	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir-TR71	2	355.081

16	Kocaeli, Sakarya, Düzce, Bolu, Yalova-TR42	2	244.701
17	Konya, Karaman -TR52	2	1580.613
18	Malatya, Elazığ, Bingöl, Tunceli-TRB1	2	1034.069
19	Manisa, Afyonkarahisar, Kütahya, Uşak-TR33	2	1701.144
20	Mardin, Batman, Şırnak, Siirt-TRC3	2	756.766
21	Samsun, Tokat, Çorum, Amasya-TR83	2	1346.353
22	Şanlıurfa, Diyarbakır-TRC2	2	1135.934
23	Tekirdağ, Edirne, Kırklareli-TR21	2	743.997
24	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane-TR90	2	862.46
25	Van, Muş, Bitlis, Hakkari-TRB2	2	1321.222
26	Zonguldak, Karabük, Bartın-TR81	2	1518.444

Similar analysis was applied to the data for 2017 in order to monitor the changes that have taken place over the course of time. The appropriate cluster number was accepted as 2 again. The interpretation of the clusters are done by using final cluster centers (see Table 6). Cluster 2 is better than Cluster 1 since Cluster 1 has greater final cluster center values. Especially, victim and delinquency numbers in Cluster 1 are much higher than in Cluster 2.

Table 6. Final cluster centers for the year 2017

Variables	Clusters	
	1	2
Witness2017	2217	1248
Foundling2017	28	10
Other2017	325	179
EscapeFromHome2017	132	39
CommitingAMisdemeanor2017	123	51
IllegalWorker2017	128	55
LostButFound2017	637	220
Fleeing2017	83	21
DrugUsage2017	14	8
Victim2017	7751	3876
DisruptingEducation2017	2	1
WorkingOnTheStreet2017	50	2
LivingOnTheStreet207	1	0
Delinquency2017	5358	2748
Abandoned2017	14	6

Table 7, on the next page shows members of each cluster. It can be observed that most of the economically developed and large provinces are in Cluster 1. For instance, İstanbul, İzmir and Adana are located in Cluster 1. Their positions are unchanged in 2017. Furthermore, it is observed that a total of 11 more regions passed into Cluster 1 in 2017. This means that the level of juvenile delinquency has increased in many regions. Ankara also has taken a place in that cluster.

Table 7. Members of clusters for the year 2017

Members of Cluster 1	Members of Cluster 2
Adana, Mersin-TR62	Ağrı, Kars, Iğdır, Ardahan-TRA2
Ankara-TR51	Balıkesir, Çanakkale-TR22
Antalya, Isparta, Burdur-TR61	Erzurum, Erzincan, Bayburt-TRA1
Aydın, Denizli, Muğla-TR32	Kastamonu, Çankırı, Sinop-TR82
Bursa, Eskişehir, Bilecik-TR41	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir-TR71
Gaziantep, Adıyaman, Kilis-TRC1	Konya, Karaman -TR52
Hatay, K. Maraş, Osmaniye-TR63	Malatya, Elazığ, Bingöl, Tunceli-TRB1
İstanbul-TR10	Mardin, Batman, Şırnak, Siirt-TRC3
İzmir-TR31	Tekirdağ, Edirne, Kırklareli-TR21
Kayseri, Sivas, Yozgat-TR72	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane-TR90
Kocaeli, Sakarya, Düzce, Bolu, Yalova-TR42	Van, Muş, Bitlis, Hakkari-TRB2
Manisa, Afyonkarahisar, Kütahya, Uşak-TR33	Zonguldak, Karabük, Bartın-TR81
Samsun, Tokat, Çorum, Amasya-TR83	
Şanlıurfa, Diyarbakır-TRC2	

In Table 8, the result of the cluster analysis with various group numbers are shown. For a reliable grouping, it is preferable that there is not a big gap among the number of group members. Therefore the analysis with k=2 is the most reliable for the year 2017.

Table 8. Distribution of regions in to the groups in non-hierarchical analysis for 2017

	Groups and Members				Total Regions
	1	2	3	4	
k=2	14	12	X	X	26
k=3	12	13	1	X	26
k=4	11	7	7	1	26

The ANOVA test reveals the contribution of the variables in the specified grouping process. In the ANOVA test, the F test statistics are used for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. Results of the ANOVA tests for the years 2008 and 2017 are demonstrated in Table 9 and Table 10 respectively. The significant values in the tables show that some variables are not statistically significant for α=0.10. In other words, they cannot be used for clustering in cluster analysis because they do not have a distinctive feature and they are considered to be statistically insignificant variables. In Table 9, these insignificant variables are Witness2008, IllegalWorker2008, Victim2008, DisruptingEducation2008 and CommittingAMisdemeanor2008. These insignificant variables are not explanatory variables in the formation of clusters.

Table 9. ANOVA test results for the year 2008

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Witness2008	760.437	1	4810.463	24	.158	.694
Foundling2008	41629.969	1	5392.104	24	7.721	.010
Other2008	558126.783	1	54507.379	24	10.239	.004
EscapeFromHome2008	70874.123	1	12041.104	24	5.886	.023
IllegalWorker2008	939.133	1	5289.767	24	.178	.677
LostButFound2008	339219.376	1	16764.989	24	20.234	.000
Fleeing2008	1734.502	1	585.319	24	2.963	.098
DrugUsage2008	1276.014	1	58.046	24	21.983	.000
Victim2008	1556512.067	1	693287.915	24	2.245	.147
DisruptingEducation2008	.763	1	3.220	24	.237	.631
WorkingOnTheStreet2008	2941393.625	1	58346.496	24	50.413	.000
LivingOnTheStreet2008	60.702	1	5.330	24	11.389	.003
Delinquency2008	3.814E7	1	832933.213	24	45.789	.000
Abandoned2008	61.071	1	20.636	24	2.959	.098
CommittingAMisdemeanor2008	202.681	1	5206.018	24	.039	.845

In Table 10, only the variable LivingOnTheStreet2017 is an insignificant variable. This variable does not have a grouping feature in the data of 2017.

Table 10. ANOVA test results for the year 2017

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Witness2017	6064598.572	1	318846.491	24	19.020	.000
Foundling2017	2315.110	1	335.768	24	6.895	.015
Other2017	137756.616	1	22527.827	24	6.115	.021
EscapeFromHome2017	55243.854	1	8716.963	24	6.338	.019
IllegalWorker2017	33507.693	1	8684.348	24	3.858	.061
LostButFound2017	34906.846	1	9321.792	24	3.745	.065
Fleeing2017	1123847.092	1	35079.168	24	32.037	.000
DrugUsage2017	25105.949	1	6334.444	24	3.963	.058
Victim2017	276.008	1	47.796	24	5.775	.024
DisruptingEducation2017	9.701E7	1	1398375.553	24	69.373	.000
WorkingOnTheStreet2017	4.487	1	1.174	24	3.823	.062
LivingOnTheStreet2017	15065.143	1	17265.390	24	.873	.360
Delinquency2017	1.059	1	.296	24	3.581	.071
Abandoned2017	4.403E7	1	1734959.077	24	25.380	.000
CommittingAMisdemeanor2017	394.081	1	51.537	24	7.647	.011

As a result, it can be stated that only one variable named Living On The Street has no distinctive feature for the year 2017, while the five variables; Witness, Illegal Worker, Victim, Disrupting Education and Committing A Misdemeanor do not have any distinctive features for the year 2008. In general, it may be stated that by 2017 juvenile delinquency is growing more rampant in terms of many indicators and the number of regions not included in the good group has increased. In 2017, both the number of members in Cluster 1 increased and the number of criminal elements (variables) that were effective in the separation of these groups. In this

regard, current changes may indicate a very significant and notable decline and deterioration in terms of juvenile delinquency.

Discriminant analysis is used to confirm and further develop findings when cluster groups are known. Therefore the results of cluster analysis - stating clearly that regions of Turkey are categorized into two groups with respect to the variables of juvenile delinquency- is examined using discriminant analysis in order to validate these groups.

In the linear discriminant analysis, Box's M test is commonly used to test the assumption of homogeneity of variances and covariance. The null hypothesis for this test is that the observed covariance matrices for the dependent variables are equal across groups. Box's M test result for our data for 2017 is 12.397 with a p-value of 0.099. It indicates that a null hypothesis is not rejected for two groups defined by cluster analysis. It has been suggested that linear discriminant analysis can be used when covariance is equal.

Eigenvalue is an indicator whether the function differentiates the groups well or not. The larger the eigenvalue, the better the function differentiates. In this study, the eigenvalue is 5.182. Wilks' lambda tests whether there is a statistically significant difference between two or more groups. With a small Wilks' Lambda value (0.162) and its significant value, the null hypothesis of the discriminant analysis is rejected. The rejected null hypothesis is that the group is a set of independent variables for which two or more groups are equal.

So it is concluded that the groups defined by cluster analysis are statistically significant. That is confirmed by the classification success of discriminant analysis. According to discriminant analysis, predicted groups membership are 14 and 12. This result is highly consistent with the previous test, cluster analysis.

5. CONCLUSION

In this study, 26 statistical regions are divided in clusters based on juvenile delinquency. The variables and data are selected from the TurkStat database. According to the cluster analysis, 26 regions are clustered into two groups. In both clusters, regions which have provinces geographically far away and have different socioeconomic structures - such as educational levels and employment levels - are located in the same clusters. The number of clusters obtained by cluster analysis is confirmed by discriminant analysis. This classification result stresses that, in terms of juvenile crime, there is no dramatic difference between eastern and western regions or northern and southern regions in Turkey. These results challenge the perception that there exists a difference between east and west in Turkey in every category.

The benefit of the analysis, for the provinces within each group, is in providing information to inform crime policies to become more effective and successful. More importantly, the results can be used to give a greater focus to the provinces in the weak group. By focusing on this group, the country can save time and money in programs while establishing effective coordination. These results can be considered to facilitate many stages from the preparation of a program for its implementation.

Limitations and Suggestions

The main limitation of the study is that it focuses specifically on the data for one particular country. Another limitation of the study is that the data is not sufficiently up-to-date, with the most recent data being from 2017. In order to eliminate these limitations, analysis can be performed with the expanded variables and can be examined by cross country comparison methods.

For further studies, the effects or the contribution of several variables of juvenile delinquency can be measured by other types of statistical analysis and prioritized or ranked using operational research methods. Studies using different methodologies will help to gain different perspectives. Through these studies, more information can be provided to the policy makers and leaders. All members of society can consider the causes and take part in preventing juvenile delinquency. As society as a whole develops improved solutions, children will move away from crime.

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