

Research on juvenile delinquency prediction based on quantitative analysis

Qi Li, Yanhong Wu

Basic Teaching Department, Shandong Huayu University of Technology, Dezhou, Shandong, China
253034
48989169@qq.com

Keywords: Juvenile delinquency; regression analysis; Matlab programming

Abstract: This paper mainly studies the influence of family, school and social factors on juvenile delinquency. First, according to the 30,000 questionnaires and case analysis conducted in various provinces and cities across the country, the opinions of adolescents of three different ages on the three main factors influencing the crime rate are obtained. Then, the relationship between three factors and juvenile crime rate is given by establishing a nonlinear regression model. In addition, the functional relationship between the three factors and juvenile delinquency is analyzed. Finally, according to the research data and the established relationship model, the corresponding early warning system is established to provide references for relevant legal departments.

1. Introduction

Survey data of the national youth crime prevention team in 2015 [1][2][3] show that, juvenile delinquency cases accounted for over 70% of the total number of cases in China. Mainly involving robbery, rape, personal injury, drug abuse, etc[4][5]. Data from China youth data center shows that the juvenile crime rate increased by 18% and juvenile crime increased by 12% during the 11th five-year plan period.

The juvenile delinquency increased by 11.5% during the 12th five-year plan period, and juvenile cybercrime increased by 16.28%. Juvenile delinquency shows a trend of diversification, violence and atrocity of criminal means, and gang crimes emerge in an endless stream. Teenagers are the future of the motherland. We must understand the current situation of juvenile delinquency [6][7][8] according to empirical research, conduct research and analysis on it, and adopt effective prevention and control mechanisms to prevent more teenagers from going astray.

The famous Italian criminal jurist beccaria said: "the prevention of crime is better than the punishment of crime, which is the purpose of all good legislators. In order to effectively control juvenile delinquency, prevention and treatment is undoubtedly the starting point and destination of the study of juvenile delinquency. Therefore, it is urgent to find out the main reasons affecting juvenile delinquency so as to prevent juvenile delinquency and maintain social stability. Legal scholars are required to give their own opinions on the study of the characteristics of juveniles and the countermeasures to prevent them from committing crimes^{[9][10]}. However, there are few methods to accurately describe and predict juvenile delinquency by data and mathematical model. This paper describes the specific relationship between the factors affecting juvenile delinquency and the crime

rate based on the previous research on juvenile delinquency related data and the nonlinear regression analysis model, so as to predict the future juvenile delinquency rate and provide reasonable Suggestions and intervention programs.

2. Research on juvenile delinquency prediction based on multiple nonlinear regression analysis

Firstly, the number of juvenile delinquents and the proportion of juvenile delinquents in China from 2007 to 2016 were obtained through investigation, interview and literature review, as shown in table 1.

Table 1 the number of juvenile delinquents and the proportion of juvenile delinquents in China from 2007 to 2016

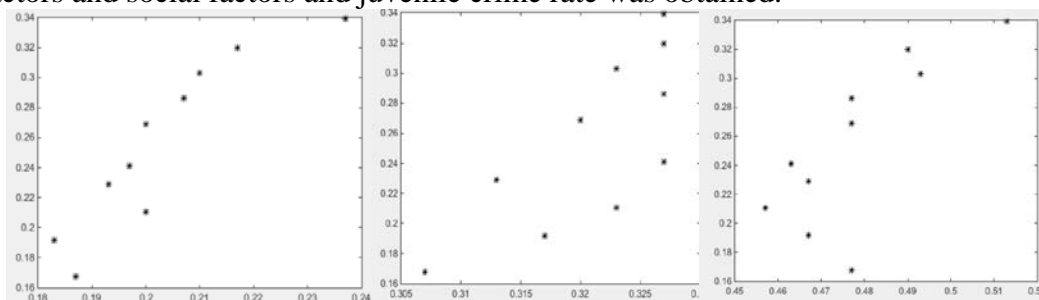
year	Total number of offenders	Juvenile delinquency	The proportion of juvenile delinquency
2007	931745	316298	0.339468
2008	1007304	322061	0.319726
2009	996666	302023	0.303033
2010	1006420	287978	0.286141
2011	1050747	282429	0.268789
2012	1173406	282990	0.24117
2013	1157784	265439	0.229265
2014	1183784	249576	0.210829
2015	1231656	236341	0.191889
2016	1219569	204657	0.167811

Secondly, factors affecting juvenile delinquency and the proportion of each factor are summarized through questionnaires and investigations in various judicial organs, as shown in table 2.

Table 2 factors affecting juvenile delinquency and the proportion of each factor

year	Family factor(A)	School factor(B)	Social factor(C)
2007	0.237	0.327	0.513
2008	0.217	0.327	0.490
2009	0.210	0.323	0.493
2010	0.207	0.327	0.477
2011	0.200	0.320	0.477
2012	0.197	0.327	0.463
2013	0.193	0.313	0.467
2014	0.200	0.323	0.457
2015	0.183	0.317	0.467
2016	0.187	0.307	0.477

By running Matlab program, the scatter diagram of the relationship between family factors, school factors and social factors and juvenile crime rate was obtained.



Family factor and crime rates School factor and crime rates Social factor and crime rates

Figure 1 The scatter plot of the relationship between the three factors and the crime rate

As can be seen from figure 1, the function relationship between family factors and crime rate obtained by Matlab curve fitting is $y = 3.2901x_1 - 0.4124$. The functional relationship between school factors and crime rate is a quadratic curve $y = 92.0326x_2^2 - 52.3241x_2 + 7.5641$, The functional relationship between social factors and crime rate is $y = 2.6378x_3 - 1.0053$. Therefore, family factor and social factor are positively correlated with crime rate, while school factor and crime rate are approximately quadratic function.

Taking the above three factors into consideration, the following nonlinear relationship model is established $y = a_0 + a_1x_1 + a_2x_2^2 + a_3x_3$. By least square fitting, the obtained parameters were substituted into the specific nonlinear regression analysis model $y = -1.2618 + 0.7682x_1 + 6.0782x_2^2 + 1.5365x_3$.

The scatter diagram of the relationship between the predicted data and the actual data and the year is made by using the Matlab operation program. The observation of the residual diagram shows that the model established is feasible, indicating that the above model is reasonable.

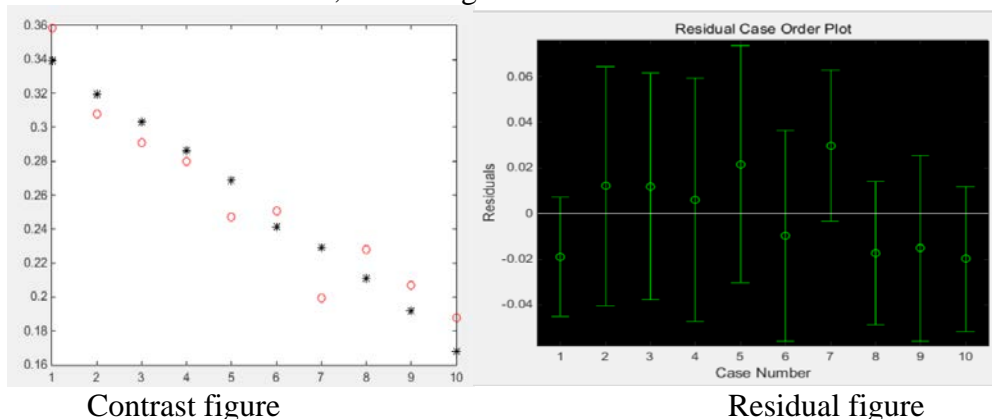


Figure 2 the observation of the residual diagram

In order to better predict the crime rate in the next decade, the following research focuses on the relationship between family factors, school factors and social factors and the time of crime. The relationship model of the above three factors and time is established through curve fitting

$$x_1 = 0.0006t^2 - 0.0108t + 0.2414, \quad x_2 = -0.0002t^2 + 0.0009t + 0.3254$$

$$x_3 = 0.0012t^2 - 0.0173t + 0.5277$$

The values of each factor in the next decade are shown in table 3 below.

Table 3 Relationship between the three factors and time

year	Family factor(A)	School factor(B)	Social factor(C)
2017	0.1952	0.3021	0.6556
2018	0.1982	0.2984	0.6659
2019	0.2024	0.2943	0.6786
2020	0.2078	0.2898	0.6937
2021	0.2144	0.2849	0.7112
2022	0.2222	0.2796	0.7311
2023	0.2312	0.2739	0.7534
2024	0.2414	0.2678	0.7781
2025	0.2528	0.2613	0.8052
2026	0.2654	0.2544	0.8347

As can be seen from table 3, among the three factors, social factors account for the largest proportion and have the largest influence on juvenile delinquency. But the influence of three factors on juvenile delinquency can not be ignored.

According to the above model, the juvenile crime rate in the next ten years is

Table 4 juvenile crime rate in the next decade

year	2017	2018	2019	2020	2021
crime rate	0.4502	0.4548	0.4628	0.4742	0.4890
year	2022	2023	2024	2025	2026
crime rate	0.5074	0.5294	0.5551	0.5846	0.6180

It can be seen from table 4 that the juvenile crime rate will increase year by year in the next decade. By 2021, the crime rate will reach 61.8 percent, a staggering figure. Therefore, it is particularly important to predict and prevent juvenile delinquency effectively.

3. Early warning management of juvenile delinquency

3.1 Family factor and early warning management

In the previous questionnaire, 30% of teenagers had little communication with their parents. Parents give their children life and are their first teachers. As parents, we should first spend enough time to accompany them and care for them, so that they can feel warm, stay away from the Internet and some friends who behave badly. Secondly, parents should set a good example for their children. Parents' education of their children is embodied in every word and deed. Every word and deed of parents is a model for children to follow. As a parent, in the process of getting along with their children, they should be optimistic, positive and proper in speech and behavior. Negative words and things should never be said or done in front of their children. If they do not allow their children to play computer or mobile phone, they should not do the same thing in front of their children. Finally, to give children a harmonious family environment. Parents with bad relationship, often quarrel in front of the child, will cause great harm to the child's psychological, is not conducive to the child's healthy growth, at the same time may become the fuse of juvenile delinquency, so as parents, must get along with each other, let the child always grow up in the environment of love.

3.2 School factor and early warning management

According to the non-linear regression analysis model established based on the survey data, it can be seen that school factor has the greatest influence on juvenile delinquency among the three factors, which presents a quadratic function relationship. Therefore, great attention should be paid to early warning management. Most children spend their teenage years in school, and school education is a key element for the formation of teenagers' outlook on life, world and values. In order to kill juvenile crime in the cradle stage, we should mainly do the following four aspects. First of all, primary and secondary schools must ensure the development of quality education, the previous exam-oriented education to young people learning to bring great pressure, not conducive to the healthy growth of young people, quality education focus on the quality of young people to develop, reduce the burden of students. Secondly, to ensure the benign communication between students and teachers, the guide of the old students, as a teacher, to do love students, all for the students, all for the students. When students make mistakes, we should not use corporal punishment, but communicate with them to find out the problems and solve them in a rational way. In this way, students' psychology will not be hurt. Again, to reasonably control the student network is applied, with the popularization of computers, mobile phones and other electronic products, the phenomenon

of "bend" more and more serious, in the face of the classroom students holding a mobile phone to play games, in the face of the classroom for students to stay up late and sleeping, in the face of Internet bar all night no return students Internet addiction, as a school, as a teacher, what measures are taken to control students' Internet use, these may be misguided children on track to have a good future, is all schools and teachers should be deeply thought. Finally, it is necessary to devote enough time to cultivate students' legal awareness while preaching, imparting knowledge and solving doubts. Teenage students are very rebellious, impulsive and have little sense of law. Therefore, children at this stage are prone to act against the law when they encounter pressure, difficulties and problems. Therefore, as a teacher should be patient to teach, speak more legal knowledge, cultivate students' legal awareness.

3.3 Social factors and early warning management

In order to prevent and reduce the juvenile crime rate, first of all, the juvenile legal system should be established. At present, the state only has relevant laws for minors. In the future, a legal system suitable for juveniles can be established so that juveniles can be protected accordingly and their illegal behaviors can be stopped in time. Secondly, the juvenile legal system should be timely supervision, timely adjustment of the legal system unreasonable provisions. Third, to strengthen the supervision of Internet cafes, Internet cafes will restrict the entry of minors provisions fall into place. Finally, to formulate relevant laws, further to the governance of the network environment, the biggest cause of juvenile delinquency from the network, the virtual sex of the network environment causes the a lot of difficulties in the management, but in this case also need to do the law to do fine, let teenagers in the use of the network have a secure network environment.

4. Conclusion

The youth are the future of the country and the hope of the nation. At present, the number of juvenile delinquency is obviously increasing, and the types are becoming more diverse, presenting a more complex situation, we must study the new situation in depth, fully mobilize the family, school and social forces, strengthen early warning and supervision, especially strengthen the prevention of juvenile delinquency, promote the healthy growth of young people.

Acknowledgements

This work was supported by the projects of Humanities and Social Sciences Research Project of Shandong Higher Education Institutions. (Project No.: J16WB01)

References

- [1] red book research group of China youth research center: main characteristics of juvenile delinquency [M]. Chinese youth research, 2013, P33.
- [2] China law yearbook editorial department: China law yearbook [J]. China law yearbook society.2013-2015, P1015.
- [3] China Internet network information center (CNNIC) : the 31st statistical report on the development of Internet in China [J]. Internet world, 2013, P22.
- [4] Ma xiaojie, sheng jianxin, zhang guanghui, yan jiapeng, ma chuanyue, li le: survey and analysis of online lifestyle of teenagers in henan province [J]. Yellow River university of science and technology, Chinese information, 2014(3).
- [5] Zhang qiaochao, on juvenile violent crimes -- from the perspective of criminal psychology [M]. Shandong university press September 2008, P7.
- [6] central leading group office of network security and informatization, state Internet information office: the 38th time National statistical report on Internet development [J], 2016, P6.
- [7] Tang di, the influence of online instigation on juvenile delinquency and its preventive measures [J]. Public security

education, 2016.06, P30.

[8] Sun jihong, challenges and countermeasures of current network moral construction [J]. People's BBS, 2013, issue 13.

[9] Yu chong, status quo review of juvenile network gang crimes and countermeasures [J]. Journal of chengdu university of technology, 2012(2).

[10] Li shujuan, research on juvenile network crime and its governance path [J]. Journal of yunnan university, 2014(1).