

# Intelligent Evaluation of the New Policy in Family Planning Based on the Differential Equation

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**Abstract.** In this paper, by collecting typical research review report, according to the national population census data, the difference equation model is established to predicting the aging of the population dividend and results. Then, according to the sex ratio at birth and fertility, we forecast the population development tendency, looking forward to the necessity of "two child policy", which it is concluded that separate two child policy has great impact on the future development of our country and the necessity of implementation.

## 1. Introduction

Some experts pointed out that China should implement "birth independently, advocating abstinence, quality first, comprehensive development" of the new population policy, and in 2015, our country let comprehensively go two foetuses policy. Also, other experts point out that the population policy of opening to execute two-step plan, the first step in the country during 2014-2015 "separate policy", which both sides of husband and wife can have two children as long as one of them is the only children; Second step, starting in 2016 the national second child plan, namely, whether both parents are the only child, they can have two children.

## 2. model assumption

In the population model forecast, no considering the moving outside and inside of the study area out of problems;

In the process of forecasting there will be no disaster, war and other factors leading to dramatic situation;

Fertility, population coefficient ratio and sex ratio in children and adolescents do not change with the population flow;

The data are real and effective.

The sorting of data given has no effect on the final result within a certain range.

## 3. Difference equation model

The model can predict coefficient of young people of all age groups, which can predict the population bring-up ratio, elderly dependency ratio, degree of ageing of population, the trend of the young adults and adolescents, the elderly coefficient, finally predict the change of population structure.

The age group the number of people I remember time period  $k$  formula has a fertility rate of the  $i$  th age groups, the age group of children I rate of population coefficient, survival rate,, we assume that the changes and not at any time period  $k$ , this assumption is reasonable in a stable environment. By following the basic facts are: the change rule of time  $k + 1$  first age group population coefficient  $k$  is period in young adults age group is children and, namely

The age group the number of people  $i$  th remember time formula  $x_i(k)$ ,  $k = 0, 1, 2, \dots, i = 1, 2, \dots, n$  fertility rate of the  $i$  is  $b_i$ , The  $i$  th age group of the population coefficient rate for children and

adolescents is  $d_i$ , Survival rates is  $s_i, s_i = 1 - d_i$ , we assumpt that  $b_i$  and  $d_i$  do not change with the change of k, this assumption is reasonable in a stable environment.

$$x_i(k+1) = \sum_{i=1}^n b_i x_i(k) \quad (1)$$

Time period  $k+1$ , the  $i+1$  th Age group population factor in young adults is the period  $k$   $i$  th The number of age groups to survive, that is:

$$x_{i+1}(k+1) = s_i x_i(k), i = 1, 2, \dots, n-1 \quad (2)$$

Tiem period  $K$  The distribution of the variables for population according to age groups:

$$x(k) = [x_1(k), x_2(k), x_3(k), x_4(k)]^T \quad (3)$$

Matrix fertility composed of rate and survival rate:  $b_i \ s_i$

$$L = \begin{pmatrix} b_1 & b_2 & b_3 & b_4 \\ s_1 & 0 & 0 & 0 \\ \dots & s_2 & 0 & \dots \\ 0 & \dots & s_3 & 0 \end{pmatrix} \quad (4)$$

Then (1), (2) suggest:

$$x(k+1) = Lx(k), k = 0, 1, 2, \dots \quad (5)$$

When the matrix  $L$  and vector  $x(0)$  according to the age group of the initial distribution is known, According to the distribution of age groups the predictable time  $k$  crowd:

$$x(k) = L^k x(0), k = 1, 2, \dots \quad (6)$$

We make the age divided into four groups, the country's population being divided into 0 to 14, 15 to 49, 50 to 59, 60-90 four ages. At this time there exist:

$$L = \begin{pmatrix} b_1 & b_2 & b_3 & b_4 \\ s_1 & 0 & 0 & 0 \\ 0 & s_2 & 0 & 0 \\ 0 & \dots & s_3 & 0 \end{pmatrix} \quad (7)$$

According to the China statistical yearbook we can check data from 2000-2008 migrants move rate and population coefficient rate in children and adolescents  $s_i$ .

Table 1: Migrants move data rate and survival rate in 2000-2008

year	2000	2001	2002	2003	2004	2005	2006	2007	2008
$b_i$	1.403	1.338	1.286	1.241	1.229	1.246	1.209	1.210	1.214
$s_i$	93.55	93.57	93.59	94.00	93.58	93.49	93.19	93.07	92.94

So we can forecast data and aged 15 to 59 through the data of 2000, and can obtained the figures by data fitting (unit: m).

Calculated by the above after know the average relative error is 0.0159, shows that the model has played a good effect, conform to the law of population development.

Table 2: Working population real value and predicted value and the average relative error in 2000-2008

year	2001	2002	2003	2004	2005	2006	2007	2008	average error
truthful data	13807	14736	15204	15355	15536	15717	16080	16364	0.0159
predicted data	13872	14181	15149	15661	15817	15871	16296	16695	

#### 4. Conclusion

Mandatory "one-child" for our country caused serious consequences, on the one, it is leading to population gender ecological imbalance; on the other hand, it is ageing and even empty nest family perspective son and ageing cause family endowment function; The third is the social perspective of Jane ageing and intergenerational population imbalance in pension gap enlargement, once the financial crisis, may produce a large area of pension crisis, the fourth is a long period of low fertility caused young population losses; while the fifth is the defense forces the one-child meant that "national security" there is a large concern. In conclusion, China does not need to lower fertility rates, but need to be able to ensure that family structure development of health and happiness, conducive to the development of population optimization development and social harmony moderate fertility, mainstream average family should have at least two children.

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