Prediction for Compulsory Education School-Age Population in 2030

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Abstract─**This article adopts the queue factor prediction method and the application PADIS-INT2.1 for population prediction to make a predictive analysis of the school-age population of compulsory education in Beijing until 2030. The research results have shown that it will generally have a rising tendency, with 36-percent growth in 2020 and 84% growth in 2030 when compared with that population in 2013.**

Index Terms—**Compulsory education; school-age population; prediction**

I. INTRODUCTION

According to China's constitution, compulsory education, namely the free education, has been taken as China's national education, which is provided for all the school-age population on the basis of common support from the whole country and every social member. In fact, it is essentially a kind of institution that requires the government to abide by relevant laws and regulations to provide necessary education in a certain period for children and teenagers of the right age. As the foundation of all the other kinds of education, compulsory education mainly features in its compulsivity, free cost and popularization. China has enforced 9-year compulsory education, including 6-year primary education and 3-year junior middle school education. Actually, its scale of development mainly depends on the number of school-age population. Beijing, the capital of China, also serves as the center of national politics, education, culture and foreign exchange. As Beijing has successfully set a benchmark for other domestic regions, it is quite significant to make a scientific prediction towards the fluctuation of the number of school-age population in Beijing, especially for its education development. There are already some relevant studies on population in Beijing, like Ma Xiaohong (2003) [1], Ma Xiaohong, Hou Yafei(2004) [2],the research group of sociology department in Tsinghua University[3],etc.

This article will carry out a prediction on the basis of the census data in 2010 and at the same time, according to some new population policies released in Beijing, it will also make corresponding adjustment towards research hypothesis in the above studies. The prediction will first take the period from 2010 to 2013 as the research object, and then make certain adjustments according to relevant statistics released by Beijing Statistic Bureau while the structure of age and gender remain unchanged. On the basis of the above, this article will then make further prediction of population from 2014 to 2030. The tool of prediction here is the application of population prediction PADIS-INT2 jointly developed by The China Population Information and Research Center and Digital China.

II. PREDICTION OF SCHOOL-AGE POPULATION

A. Parameter Assumption

1. Life Expectancy

In 2010, the life expectancy of residents with Beijing household registration is around 80.8 years old while permanent non-native residents hold different views of life expectancy, with male 76.94 years old and female 81.51 years old, respectively. According to the Beijing's actual condition, this article will make the following research assumptions: in 2030, the life expectancy of residents with household registration will be around 82 years old (male) and 85 years old (female) while that of non-native residents will be around 79 years old (male) and 84 years old (female).

2. Total Fertility Rate and Fertility Pattern

As "one-child policy" strictly enforced in Beijing, the total fertility rate of Beijing's registered population generally is no more than 1 percent. However, as "two-child policy" has been enforcing since 2016 in Beijing, there will be a certain growth in the total fertility rate of Beijing's registered population. In 2019, this rate will increase to 1.3 percent in 2019 and the average annual increase in newly-born population will be around 54.2 thousand [4]. This article has formulated three different plans to predict the total fertility rate of permanent household registration residents and permanent non-native residents. See in Chart 1.

Fertility Pattern: Make an assumption that compared with that of 2010, the fertility pattern of women of childbearing age of both permanent household registration residents and non-native residents in 2030 will remain the same.

3. Sex Ratio at Birth

In 2010, the sex ratio at birth of permanent household

registration residents reached to 109 while that of non-native residents is 120. With the release of "two-child policy" and changes taking place in people's bearing attitudes, this article will make an assumption that the sex ratio at birth of permanent household registration residents and non-native residents will decrease to 105 and 115, respectively. See in Chart 1.

4. Migrant Population

Volume of migration. Each year in Beijing, there are certain amount of people moving in and out, with the former is dominant, which means that the net migration, namely the mechanical growth of population is increasing, including the registered migrant population and net migrant of non-native population.

From 2005 to 2013, Beijing's mechanical growth of population is between the range of 200 and 700 thousand while this number has increased to 600 to 700 thousand before and after the Beijing Olympic Game in 2008. As Beijing's economic growth is showing signs of slowdown, the government has been releasing certain kinds of administrative and industrial policies to limit the increase of population. Besides, along with the gradual development of integration in Jing (Beijing)-Jin (Tianjin)-Ji (Hebei)Area, there will be a more balanced geographical development across the country and at the same time, the trend of migrants flowing to big cities, especially the share of migrants moving into Beijing will be alleviated to some degree. [5] Taking the above into consideration, this article has formulated three plans (higher-middle-lower). See in Chart 1.

5. Migration Model

Generally, the number of registered migrant population is mainly affected by the following conditions: First, undergraduates or postgraduates who attend colleges and universities in Beijing from other regions find jobs that can provide them Beijing's household registration. Second, the government or other kinds of institutions have released talent introduction policies. Third, to unite with the spouse living in Beijing with Beijing's household registration, one from other regions can also come to Beijing and become a permanent local resident with household registration. Forth, according to relevant regulations, part of demobilized servicemen can have a job in Beijing, also with Beijing's household registration. All of the above regulations and policies have developed a younger composition of the registered migrant population, with more male than female in it. From 1990 to 2000, the share of people aged 15 to 59 years old have reached over 85 percent and that of people aged 60 years old and older is around 1 to 2 percent. Besides, the sex ratio at that period is also on a declining curve, with 143 in 2000. [6]

As relevant data is missing from 2000 to 2010, this article will carry out the study on the basis of relevant data in 2000, and foster a pattern of net registered migrant population while taking international standard migration pattern as reference [7]. Each year, the number of immigrant population is mainly affected by economic development. On the basis of international standard migration pattern, this article has also taken relevant statistics of the age composition of permanent immigrant population in 2010 into consideration and finally takes the mean of statistics in 2000 and 2010 as the net migrant pattern of non-native population.

TABLE I.
PREDICTION PARAMETER

Plan	Total Fertility Rate	Annual Net Migrant Regulation	Life Expectancy	Sex Ratio
Lower	A linear increase from 0.7 in 2010 to 1 in 2014; 1 remain unchanged from 2015 to 2030.	2010-2013: Actual data; 2014-2020: annual average of net migrant population is 150 thousand; 2021-2030: annual average of net migrant population is 120 thousand, with 55% male and 45% female.	Three plans have the same content. Male：A linear increase from 79.1 years old in 2010 to 82 years old in 2030. Female： A linear increase from 82.57 years old in 2010 to 85 years old in 2030.	Three plans have the same content. Taking 109, the sex ratio at birth in 2010 as the base, there is a linear decrease to 105 in 2030.
Middle	A linear increase from 0.7 in 2010 to 1.20 in 2014; 1.20 remain unchanged from 2015 to 2030.	2010-2013: Actual data; 2014-2020: annual average of net migrant population is 180 thousand; 2021-2030: annual average of net migrant population is 100 thousand, with 55% male and 45% female.		
Higher	A linear increase from 0.7 in 2010 to 1.35 in 2014; 1.35 remain unchanged from 2015 to 2030.	2010-2013: Actual data; 2014-2020: annual average of net migrant population is 200 thousand; 2021-2030: annual average of net migrant population is 100 thousand, with 55% male and 45% female.		

B.   Prediction Results

At present, our country implements nine-year compulsory education, including 6-year primary education and 3-year junior middle education. See prediction results in Chart 2.

The school-age population of compulsory education in Beijing is generally on a rising tendency in all the three plans while the number in the middle plan is around 2.02 million. In 2013, there are 1.1 million students at school receiving compulsory education while it has grown to 1.5 million in 2020 and 2.02 million in 2030, increasing by 36% and 84% respectively. See it in Tab. 1 and Fig. 1.

TABLE II.

PREDICTION RESULTS OF BEIJING'S SCHOOL-AGE POPULATION OF COMPULSORY EDUCATION UNDER 3 PLANS (HIGHER, MIDDLE, LOWER) (2014～2030) (IN 10 THOUSAND)

Year	Primary Education（6-11 years old）			Junior Middle School（12-14 years old）			Compulsory Education（6-14 years old）		
	Lower	Middle	Higher	Lower	Middle	Higher	Lower	Middle	Higher
2014	73.10	74.34	75.59	29.73	30.20	30.66	102.83	104.54	106.25
2015	79.07	80.68	82.29	30.70	31.30	31.90	109.77	111.98	114.19
2016	85.14	87.09	89.03	31.75	32.49	33.23	116.89	119.58	122.26
2017	89.14	91.76	94.18	33.49	34.38	35.27	122.63	126.14	129.45
2018	92.56	96.34	99.52	36.39	37.45	38.50	128.95	133.79	138.02
2019	95.62	101.07	105.31	39.48	40.72	41.96	135.1	141.79	147.27
2020	98.16	105.83	111.45	42.78	44.21	45.64	140.94	150.04	157.09
2021	99.75	110.21	117.56	45.75	47.38	49.01	145.5	157.59	166.57
2022	100.72	114.57	124.06	48.62	50.40	52.18	149.34	164.97	176.24
2023	103.04	120.54	132.38	49.19	51.45	53.52	152.23	171.99	185.9
2024	104.55	125.74	140.01	49.41	52.63	55.26	153.96	178.37	195.27
2025	105.17	130.00	146.74	49.36	54.10	57.63	154.53	184.1	204.37
2026	104.86	133.21	152.38	51.07	57.54	62.17	155.93	190.75	214.55
2027	103.65	135.30	156.82	52.43	60.73	66.53	156.08	196.03	223.35
2028	101.46	136.07	159.80	53.44	63.63	70.65	154.9	199.7	230.45
2029	98.37	135.55	161.31	54.07	66.15	74.43	152.44	201.7	235.74
2030	94.54	133.85	161.43	54.21	68.15	77.70	148.75	202	239.13

III. DATA ANALYSIS

A. The Data Analysis of School-age Population of Primary Education (6-11 Years Old) in Beijing

From Tab. 2 and Fig. 2, we can see that the school-age population of primary education in Beijing is generally on a rising tendency in all the three plans. In the lower plan, the number of that population is first on an increase trend and then on a decline trend, namely an inverted U-shaped curve. As for the middle plan, the peak population of primary education in Beijing will be around 1.3607 million in 2028, 1.72 times primary school students in 2013 (789 thousand) while after 2028, the number of that population will persistently decrease to 1.3385 million in 2030, around 1.7 times primary at-school students in 2013.

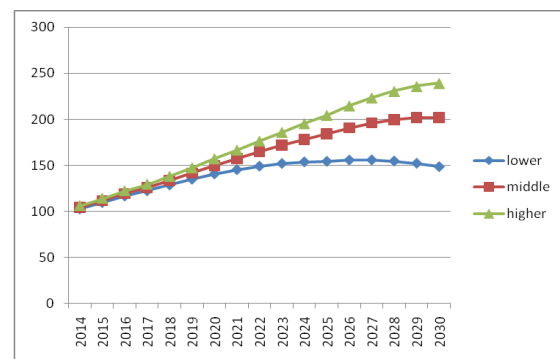In 2020, this number will grow to 1.0583 million, approximately 1.34 times primary at-school students in 2013.

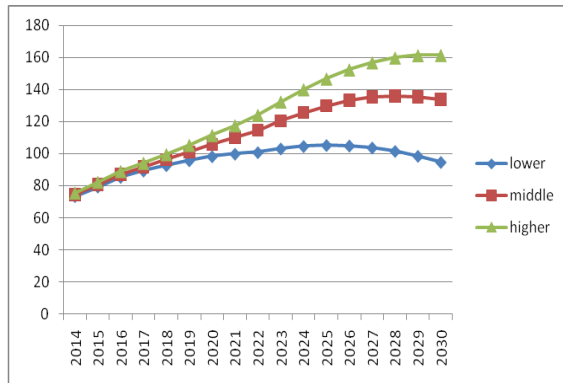Figure1. The change of Beijing's school-age population of compulsory education

Figure2. The change of Beijing's school-age population of primary education

B.   The data analysis of school-age population of junior middle education (6-11 years old) in Beijing

From Tab. 2 and Fig. 2, we can see that the school-age population of junior middle education in Beijing firstly has a slight decrease while after 2014, it will on a constant increase trend. In the middle plan, the peak population of junior middle education in Beijing will be around 681.5 thousand in 2030, around 2.19 times junior middle school students in 2013 (311 thousand).

In 2020, this number will grow to 442.1 thousand, approximately 1.42 times junior middle school students in 2013.
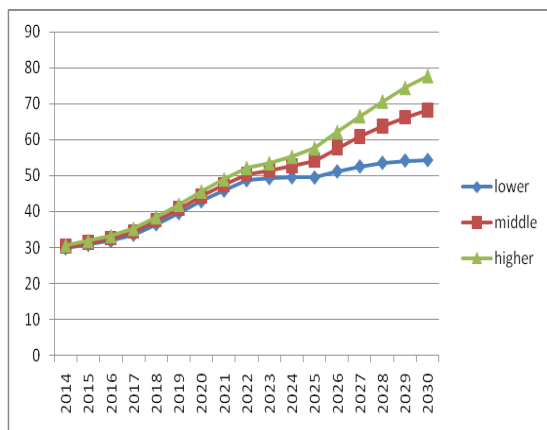

Figure3. The change of Beijing's school-age population of junior middle school education (in 10 thousand)

IV. CONCLUSION AND QUESTIONS

From 2014 to 2030, the school-age population of compulsory education in Beijing is on a steady increasing trend, with 35% in 2020 and 71% in 2030 respectively. Both the school-age population of primary education and junior middle school education will have a rising tendency. However, the peak population of primary education in Beijing will take place in 2028 and the population of school-age primary students in 2030 is around 1.7 times in 2013 while the peak population of junior middle education in Beijing will rather take place in 2030, around 2.19 times in 2013.

The rapid increase in the school-age population of compulsory education actually means that there will be a larger requirement of resources for compulsory education, which has placed heavy pressure on the development of compulsory education. Therefore, the government in Beijing needs to provide more public education resources, especially for compulsory education. Meanwhile, as non-native children constantly flowing into Beijing, the local government also has to shoulder more educational responsibilities and public expenses for education.

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