

## Comparative Analysis on the Indicators of Average Years of Education and Adult Illiteracy Rate

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**Keywords:** Average Years of Education (AYE); Adult Illiteracy Rate (AIR); Comparison

**Abstract:** This paper is a comparative analysis, which mainly compares two education development level indicators of Average Years of Education (AYE) and Adult Illiteracy Rate (AIR). In China, AIR is influenced by elder illiteracy seriously. This article, firstly analyzes the problems of using AIR, and secondly introduces the indicator of AYE and compares the two indicators. Finally, points out the conclusion, that it should be using AYE to replace AIR to measure regional education development level. Thus, we could get the values which are more realistic and more reliable.

Since reform and opening up, 30 years ago, economic development of China is rapidly, and education has also made great achievements. Like huge difference in regional economic developing, the development of education in China also has huge imbalances. The measurement of education developing level and degree is always a main content to measure social development.

Since 1990, the United Nations Development Program (UNDP) has published Human Development Report annually, in which creatively used a index——Human Development Index (HDI) to integrated measure the human development in the world. HDI includes three aspects<sup>[1]</sup>, which are health, education and living standard. The education development index makes up of Adult Illiteracy Rate (AIR) and Composite Enrollment Rate (CER), and AIR accounting for 2/3 weight. Since 1997, the UN has published China Human Development Report annually, in which also follows the above-mentioned indicators to measure human development situation in provinces in China<sup>[2]</sup>.

### The problems of using Adult Illiteracy Rate

For historical reasons, to a large extent, China's AIR is impacted by population age structure. Overall, in China, elderly people have low education level and more illiteracy, which result that the higher proportion of elderly population, the higher AIR.

At present, China is undergoing a rapid process of population aging, which has a significant impact on AIR. So, in China, the reliability of the regional education development level measured by AIR indicator is open to question<sup>[4]</sup>. This paper takes China national statistics in 2005 for example to illustrate the impact of age structure to the AIR.

To speak with one voice, in this article, "illiterates, half illiterates" and "have not go to school" are all regarded as illiterate. And the illiterate population which aged 15 and over is all called as adult illiteracy. After collation and calculation the data from China 1% Population Sample Survey Data 2005 and China Statistical Yearbook 2006, we can get illiterate population proportion aged 60 and over accounted for aged 15 and over<sup>[3]</sup>, see at table 1 below .

Table 1 lists the regional demographic illiteracy profile of China, including the adult (15 years and over) illiteracy and the elderly (aged 60 and over) illiteracy situation. But from this table, we could only know that the elderly illiteracy rate is higher than the adult illiteracy rate roughly, and could not know the specific influence of elderly illiteracy population to the regional illiteracy rate in China.

Then sorting provinces again, which should follow the descending of the illiteracy rate level. Thus, we can obtain Table 2.

Table 1 China regional illiteracy population (2005)

Area	15+ Population	15+ Illiteracy	AIR (%)	60+ Population	60+ Illiteracy	60+ IR (%)	60+ Illiteracy / 15+ population (%)
Total	13664737	1508706	11.04	2209366	935714	42.35	6.85
BJ	182650	7152	3.92	29743	5743	19.31	3.14
TJ	120572	5793	4.80	18788	4601	24.49	3.82
HeB	746574	53638	7.18	107077	37165	34.71	4.98
ShX1	349524	19472	5.57	48741	15090	30.96	4.32
NMG	262000	29476	11.25	36045	16341	45.33	6.24
LN	479167	22839	4.77	77918	19118	24.54	3.99
JL	307428	17994	5.85	40745	12849	31.54	4.18
HLJ	430771	26633	6.18	57350	17497	30.51	4.06
ShH	214169	11213	5.24	37024	9122	24.64	4.26
JS	835732	83702	10.02	152472	64057	42.01	7.66
ZhJ	545255	65172	11.95	92011	42070	45.72	7.72
AH	623028	119875	19.24	118064	69115	58.54	11.09
FJ	381435	49279	12.92	56092	26853	47.87	7.04
JX	427446	45038	10.54	68665	29207	42.54	6.83
ShD	1029220	127449	12.38	171154	83462	48.76	8.11
HeN	979235	95891	9.79	148667	66157	44.50	6.76
HuB	613088	74114	12.09	102436	47887	46.75	7.81
HuN	680670	58377	8.58	118654	43656	36.79	6.41
GD	956604	57370	6.00	123434	43271	35.06	4.52
GX	470371	40625	8.64	83737	30173	36.03	6.41
HaiN	83637	8162	9.76	12340	5325	43.15	6.37
ChQ	293816	34244	11.65	60616	24510	40.43	8.34
SCh	849493	141104	16.61	176872	82535	46.66	9.72
GZh	353816	75750	21.41	60450	34589	57.22	9.78
YN	446987	89713	20.07	64292	39110	60.83	8.75
XZ	26656	11953	44.84	3406	2756	80.92	10.34
ShX2	396108	40903	10.33	63371	25027	39.49	6.32
GS	263000	54780	20.83	38715	21721	56.10	8.26
QH	54595	13143	24.07	6749	3519	52.14	6.45
NX	58454	10935	18.71	7348	3991	54.31	6.83
XJ	203235	16919	8.32	26389	9196	34.85	4.52

Source: China 1% Population Sample Survey Data 2005  
China Statistical Yearbook 2006

Table 2 China regional illiteracy proportion and ranking of aged 15+ and 60+ (2005)

Area	AIR		PR of 60+/15+		IR of 60+/15+		IR of 60+	
	%	↑	%	↑	%	↑	%	↑
Total	11.04		16.17		62.02		42.35	
BJ	3.92	1	16.28	20	80.3	29	19.31	1
LN	4.77	2	16.26	19	83.71	31	24.54	3
TJ	4.8	3	15.58	16	79.42	28	24.49	2
ShH	5.24	4	17.29	25	81.35	30	24.64	4
ShX1	5.57	5	13.94	9	77.5	27	30.96	6
JL	5.85	6	13.25	6	71.41	21	31.54	7
GD	6	7	12.90	4	75.42	25	35.06	10
HLJ	6.18	8	13.31	7	65.7	18	30.51	5
HeB	7.18	9	14.34	10	69.29	20	34.71	8
XJ	8.32	10	12.98	5	54.35	7	34.85	9
HuN	8.58	11	17.43	26	74.78	24	36.79	12
GX	8.64	12	17.80	27	74.27	23	36.03	11
HaiN	9.76	13	14.75	14	65.24	16	43.15	17
HeN	9.79	14	15.18	15	68.99	19	44.5	18
JS	10.02	15	18.24	28	76.53	26	42.01	15
ShX2	10.33	16	16.00	17	61.19	12	39.49	13
JX	10.54	17	16.06	18	64.85	15	42.54	16
NMG	11.25	18	13.76	8	55.44	9	45.33	19
ChQ	11.65	19	20.63	30	71.57	22	40.43	14
ZhJ	11.95	20	16.87	23	64.55	13	45.72	20
HuB	12.09	21	16.71	22	64.61	14	46.75	22
ShD	12.38	22	16.63	21	65.49	17	48.76	24
FJ	12.92	23	14.71	12	54.49	8	47.87	23
SCh	16.61	24	20.82	31	58.49	11	46.66	21
NX	18.71	25	12.57	3	36.5	3	54.31	26
AH	19.24	26	18.95	29	57.66	10	58.54	29
YN	20.07	27	14.38	11	43.59	5	60.83	30
GS	20.83	28	14.72	13	39.65	4	56.1	27
GZh	21.41	29	17.09	24	45.66	6	57.22	28
QH	24.07	30	12.36	2	26.77	2	52.14	25
XZ	44.84	31	12.78	1	23.06	1	80.92	31

From table 2, we can get that there is 25 provinces beyond 50% (illiteracy rate of 60+/15+) in China, which fully displays the population structure influence AIR enormously. People aged 60+ were born before the foundation of new China, when China's education level was not high<sup>[4]</sup>. We should pay attention to the important economic position of Beijing, Tianjin, Shanghai and the northeast old industrial base. Because the literacy of the population aged 60+ in these areas is obviously higher than other areas that the population aged 60+ lead to a lower illiteracy in these areas. This paper will not discuss such areas too much, but use three provinces of Xinjiang, Guangxi and Jiangsu for example to analysis the impact of uneven distribution of illiteracy population structure to adult illiteracy rate.

In China, the AIR of Xinjiang ranked at the tenth. And the population ratio of 60+/15+ which is 12.98%, ranked at the fifth. Thus, the population age structure here is young relatively. Illiteracy rate of aged 60+/15+ is also low, ranked at the seventh. In Xinjiang, more than one half illiteracy populations are aged 60+, but because of the younger population structure, the proportion of old people to adult is low. This means that the impact of old illiteracy to AIR is not great in Xinjiang.

The AIR of Guangxi ranked at the 12th in China. The AIR of Guangxi is low, and the population ratio of 60+/15+ is high (means aging degree is high). Thus, the whole level of AIR was significantly pulled lower by two factors of the old illiteracy rate and old population rate.

Different to people's inherent impression, in China, the education development level of Jiangsu just ranked at a mean level by use the education indicator of AIR. The Illiteracy rate of aged 60+/15+ is high, which reached to 76.63%, nearly to Shanxi and Hunan. The aging degree of Jiangsu is much higher than Shanxi and Hunan, which PR of 60+/15+ is 18.24%. So the AIR of Jiangsu is much higher

than one of Shanxi and Hunan. Of course, Jiangsu is naturally behind Shanxi and Hunan by using AIR to measure education level.

So, at present, under the background of great difference between regional aging degrees in China, using AIR to measure regional education development level can not reflect the reality of education development obviously. Even, may distort the reality facts.

### The characteristic of average years of education indicator

An average year of education (AYE) is also an indicator to measure education development level, which is different in the reaction angle. AIR, which is a structure indicator, reflects the condition of education popularization. AYE, which is an intension indicator, reflects the overall education level of the population, which refers to the population average accepted the year of education (including adult education degree, not including non-degree training), and also reflected the education popularization condition<sup>[5]</sup>. Though AYE is also influenced by age structure, to be an average indicator of whole population, it could weaken the influence of age structure to a great extent.

$$\bar{Y} = \frac{E}{P} = \frac{\sum P_i E_i}{P}$$

The formula of AYE is

$E$  is the sum of years of total population accepted education;  $P$  is the total number of the whole population;  $P_i$  is the population number of having a specific education degree;  $E_i$  is a coefficient for people have a education degree of  $I$ ,  $i$  defined by the length of schooling. There are three methods to define the coefficient  $E_i$ :

One is using current years of schooling. Years of schooling will be considered as years of education. No matter who enters a specific education level, we will consider he/she completed that education level. Thus, according to China's current years of schooling, we define the coefficient  $E_i$  as 0 (illiteracy), 6 (Primary school), 9 (Junior high school), 12 (High school) and 16 (college and above).

Second is defined by actual survey results. Since 1998, years of accepted education has been added to the population sample survey item, asked to survey both education degree and years of education, but not included years of non-full-time education. Thus, we can calculate the coefficient  $E_i$  of different degree.

Third is based on the current education years to fix the coefficient  $E_i$ . This method divides people who have the same education degree into three cases as graduation, non-completion and in school artificially.

Method one ignore the difference between the school system. Such as the differences in college and college above, differences in graduation and non-completion, and so on. To some extent, method one overestimated people's years of education<sup>[6]</sup>. Method two not including years of non-full-time education, underestimate to the actual value. And the method used to calculate the coefficient  $E_i$  need to be adjusted every year based on the census data, which having practical difficulties.  $E_i$  of method three is given subjectively. And to determine  $E_i$  is a tedious work, complex and not easy to do.

Because  $E_i$  calculated by the first method is simplify calculation and easily got, we choose the first method to calculate AYE.

### Using AYE indicator to substitute AIR indicator

Using the AYE formula, we can calculate China's regional AYE from 2005 to 2008. Thus, we get different values of regional education development level by using different indicators of AIR and AYE.

To analysis the regional education development level clearly, we compile table 3. AYE is ranged by descending because that a higher AYE means a longer average education years and a higher education level. AIR is ranged by ascending, because that a higher AIR means a larger illiterate population and a lower education level. Thus, according to education development levels, the

compositor of AYE and AIR are both ranged by descending. From table 3, we can see from 2005 to 2008, the rankings of AYE and AIR have are many differences.

Table 3 Regional Ranking Compare of AYE and AIR (2005-2008)

2005		2006		2007		2008	
AYE	AIR	AYE	AIR	AYE	AIR	AYE	AIR
BJ	1	BJ	1	BJ	1	BJ	1
ShH	2	ShH	2	ShH	2	ShH	2
TJ	3	TJ	3	TJ	3	TJ	3
LN	4	LN	4	LN	4	LN	4
JL	5	ShX1	5	ShX1	5	JL	5
HLJ	6	JL	6	JL	6	ShX1	6
ShX1	7	HLJ	7	HLJ	7	GD	7
GD	8	GD	8	GD	8	HLJ	8
NMG	9	ShX2	9	XJ	9	XJ	9
XJ	10	XJ	10	JS	10	ShX2	10
HeB	11	HuB	11	HuB	11	HuB	11
JS	12	JS	12	HuN	12	HuN	12
HaiN	13	NMG	13	ShX2	13	JS	13
ShX2	14	HaiN	14	NMG	14	HeB	14
HuN	15	HuN	15	HaiN	15	HaiN	15
HeN	16	HeB	16	JX	16	HeN	16
HuB	17	ShD	17	ShD	17	NMG	17
ShD	18	ZhJ	18	HeN	18	ShD	18
GX	19	HeN	19	HeB	19	JX	19
ZhJ	20	GX	20	ZhJ	20	ZhJ	20
FJ	21	FJ	21	GX	21	NX	21
JX	22	JX	22	NX	22	GX	22
ChQ	23	NX	23	FJ	23	FJ	23
NX	24	ChQ	24	ChQ	24	ChQ	24
AH	25	AH	25	SCh	25	SCh	25
GS	26	SCh	26	AH	26	AH	26
SCh	27	QH	27	QH	27	QH	27
QH	28	GS	28	GS	28	GS	28
GZh	29	YN	29	GZh	29	GZh	29
YN	30	GZh	30	YN	30	YN	30
XZ	31	XZ	31	XZ	31	XZ	31

Still look at provinces of Xinjiang, Guangxi and Jiangsu. The rankings of education development level of Xinjiang, using these two indicators, change very small. In 2005, the two rankings were the same; in 2006 and 2007, just floated two positions. That means the population age structure nearly not impact education level in Xinjiang.

From 2005 to 2007, Guangxi had a large change. Compared to the ranking of AIR, the rankings of AYE dropped behind it, and positions dropped 7, 11 and 10 separately. And the rankings of AYE were much consistent with the actual situation.

The rankings changes were also obviously in Jiangsu. Compared to the ranking of AIR, the rankings of AYE had move up rapidly. And positions had increased 3, 6 and 6 separately. To some extent, eliminated the influence of age structure to education indicator, and reflected the true recent level of education and its development of Jiangsu.

In a word, AYE indicator is better than AIR indicator. It could reflect and measure the regional education levels more comprehensively, more dynamic, and more accurately. So, in the future, when we want to measure China's regional education development levels to reflect the regional education development levels more realistic and more reliable, we should use AYE indicator to replace AIR indicator

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