Use the Poisson Regression Model to Study Primary school Aboriginal Teachers in Taiwan

Lung-Hsing Kuo, Hsieh-Hua Yang, Hung-Jen Yang, Shang-Ping Ko, Hsung-Chih Huang

Abstract: - This study aims to find aboriginal teacher education gaps and the relationship between age group and gender of Taiwanese aboriginal teacher in primary school. In this study, the SPSS statistical software is used in this study, Chi-square test to test for the significance of relationships between variables cross-classified in a bivariate table. The research data would base on project report of teacher education statistics supported by Ministry of Education, Taiwan. The research population is nationwide in-service aboriginal teachers in junior high schools to obtain 1531 subjects. We found there is a real relationship between age group and sex. The result shows we have strong evidence that the female Taiwanese aboriginal teachers are more than male Taiwanese aboriginal teachers in primary school with age group 22-29 to 45-49. We suggest there is a need to make a long term planning on primary school aboriginal teacher education sufficient to support primary school aboriginal education.

Key-Words: Poisson Regression Model, teacher education, Taiwanese aboriginal teacher, primary school education

I. INTRODUCTION

In Taiwan, "Aborigines" includes mountains tribes, namely the Atayal, Bunun, Tsou, Rukai, Paiwan, Yami, Saisiyat, Amis, Puyuma, and Thao, and plains tribes including the Kavalan , Sakizaya, Ketagalan, Taokas, Siraya, Pazeh etc. The first thirteen tribes in the list are recognized by the present-day Taiwanese authorities

Based on the law point of views, in 1994, the modification of Constitution is formally recognized the status of “Aborigines” and to preserve their tribal culture; in 1998, “Aboriginal Education Act” announced, it provide the legal based of Aboriginal education, protection, and rights.

The education outcomes of Taiwanese aboriginal people are the most important indicator of society improvement in Taiwan because of our environments are driven by changes in society, fast growth by science, technology and knowledge development in recent years.

Since moving to Taiwan, the central government's educational policy for Aboriginals has gone through four stages, “the equal treatment stage”, “the fusion stage”, “the open development stage”, and “identity development stage”. The last stage is from 2001 to present day. In 2000, the Taiwan Provincial Government was trimmed and downgraded. The affairs handled by its education department were placed under MOE jurisdiction. The program to reinforce aboriginal student education of the educational reform movement project continued to be promoted. In 2003, the National Education Development Conference was announced with "respecting aboriginal identity, developing aboriginal tribal education" as the objective. In September 2004, the Aboriginal Education Act was revised and announced, mandating the development of aboriginal education [3].

According to Council of Indigenous Peoples, Executive Yuan, in 2009, the Taiwanese aboriginal education statistics shows 85.88% of Taiwanese aboriginal their highest educational recodes are high school and vocational school or below, which means there are only 14.12% Taiwanese aboriginal their highest educational records are above high school and vocational school. It is 21.28% less than non-aboriginal [4].

From the development of education historical context, the recipients of the educational experience vary by different race and class. Therefore the existing race and class issues of education become the focus for educators [1]. In Western country, the major education system is increasingly being seen as important issue on the topics of education and race [2].

Aboriginal people have special culture and historical background. Teachers are professionals and should meet the needs and give aboriginal students a better quality of education. When teachers have more professional knowledge and passion, they can be able to offer more study opportunities for students [5]. Therefore, to improve learning for aboriginal students need aboriginal teachers to teach them.

A. Teacher Education Reform

To comply with the developments of democratization, our nation expected through a free market mechanism to form more excellence teachers. Thus, “Teacher Education Act” and “Teacher Act” passed in 1994 and 1995. From then on, there has been a major teacher education reform in this country: teacher education institutions were expanded beyond Teacher’s Colleges/Normal Universities to incorporate Universities with Teacher Education Centers; the plan of trainee teacher’s controlled supply and demand has also shifted from a traditional, formerly government allowance with zero tuition fee and teaching job assignment, unified and planned system to an open sufficient reserve system. Teacher education has changed from the closed-door policy to a mechanism for free competition [6].

B. Teacher Retirement

The retirement of public primary school teachers is divided into voluntary retirement and compulsory retirement. According to Article 4 to 6 under the Civil Service Retirement Act; the conditions for voluntary retirement are the teacher teaching more than 5 years and over 60 years of age, or 25 years of service. The conditions for compulsory retirement are teachers with more than 5 years of service and over 65 years old, or over 5 years of

service and not competent for teaching due to mental or physical disadvantages. Therefore, the expected retirement ages are 50 to 54 [7].

Until 2009, there are 500 reserved aboriginal teachers but it only 17.47% of the total number of aboriginal teachers in that year. However, a big decreasing on the number of aboriginal teacher students who can get the government allowance with zero tuition fee in recent 5 years that can be results in aboriginal teacher education gaps [4].

This study aims to find the aboriginal teacher education gaps and relationship between age group and gender of Taiwanese aboriginal teacher in primary school. The rest of the article is structured as follows. First, the brief research goals and definition of terms are given in this section. Second, the methods, data sources, models, and instrument are explained, followed by the results and findings. The last section concludes with a summary in this study.

C. Aim of the Study

The research goals in this study are:

- Does aboriginal teacher education gaps exist in primary school ?
- Is there any relationship between sex and age group of Taiwanese aboriginal teachers in primary school?
- Does sex affect number of Taiwanese aboriginal teachers in primary school?
- Which sex effect number of Taiwanese aboriginal teachers in primary school?
- Does age group affect number of Taiwanese aboriginal teachers in primary school?
- Which age group effect number of teachers in primary school?

D. Definition of Terms

The variable definitions as follows:

- **Sex:** "female" or "male"
- **Age group:** 22-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55 above.

II. Study Design

A. Research Subjects

Nationwide In-Service Teacher Advancement Information Web (http://www.inservice.edu.tw/) is the network provides teachers with a communication platform for in-service teacher advancement education in Taiwan and provides in-service training analytic statistics for relative educational authorities' policy- making use.

In this study the subjects are the Taiwanese aboriginal teachers in primary school in 2009. We use 2009 Nationwide Teacher in-service Advancement Education Information Web (http://inservice.edu.tw/) database to get the subjects and Yearbook of Teacher Education Statistics (supplementary report) [8] as a reference to obtain 1531 subjects. The basic data analyses are shown in Table 1 and Figure 1 and 2.

Table 1 frequency table by gender

Sex	Frequency	Percent (%)
Female	845	55.2
Male	686	44.8
Total	1531	100.0

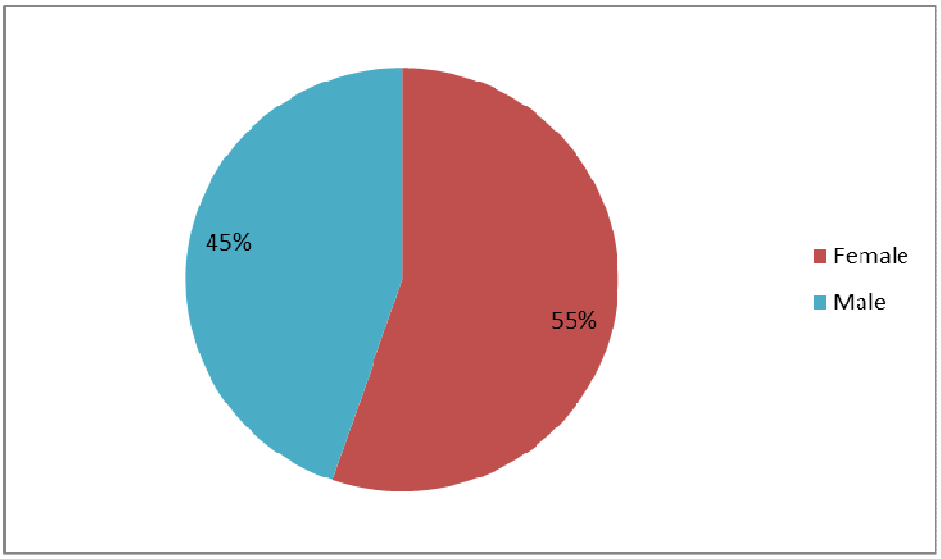

Figure 1. Pie graph of gender

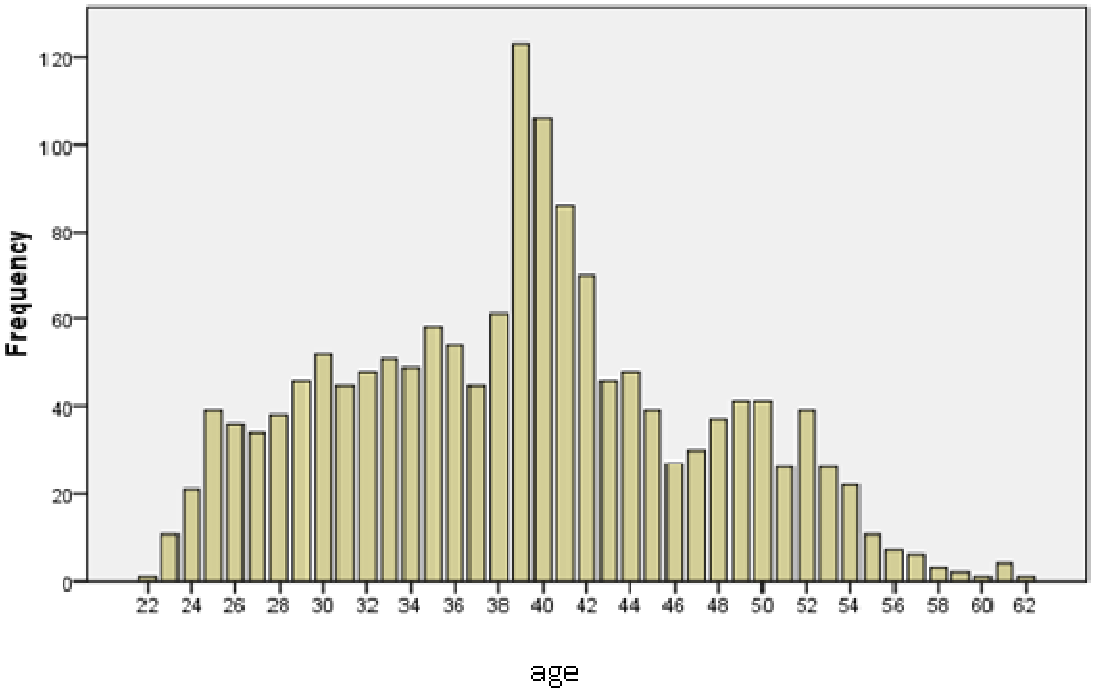

Figure 2. Age distribution

B. Instrument, Data Analysis & Assumption

The SPSS statistical software is used in this study. We use Chi-square test to test for the significance of relationships between variables cross-classified in a bivariate table. In our case, the variables are the age group and sex. The null hypothesis in this study is there is no relationship between age group and sex. Then, we use general loglinear analysis procedure analyzes with Poisson distribution to predict the odds ratio of the number of primary school Taiwanese aboriginal teachers among age and sex groups. We assumes the number of Taiwanese aboriginal teachers in primary school has a Poisson distribution, and assumes the logarithm of its age group and sex can be modeled by a linear combination of unknown parameters.

III. Results

Figure 2 and Table 2 shows the number of Taiwanese aboriginal teachers in primary school aged from 22 to 29, 30 to 34, 35-39, 40-44, 45-49, 50-54, and 55 above is 14.8%, 16.0%, 22.3%, 23.3%, 11.4%, 10.1%, and 2.3% of total Taiwanese aboriginal teacher in primary school. Overall, the highest percentage of Taiwanese aboriginal teachers in primary school falls in the age group of 40 to 44 and teachers of 55 years old or above represent only 2.3% which is the lowest.

Table 3 is the frequency table of Taiwanese aboriginal teachers in primary school between their age group and sex group. It shows both of female and male Taiwanese aboriginal teachers in primary school falls in the age group of 35 to 39 has the highest percentage and age of 55 years old or above is the lowest; for the male aboriginal teachers falls in the age group of 40 to 44 has the highest percentage and age of 55 years old or above is the lowest. The female Taiwanese aboriginal teachers in primary high school their age are below 45 years old shows relatively more than male teachers.

Table 3 is the cross table for age group and sex. It shows the expected count and observation value is about the same for Taiwanese aboriginal teachers in primary school between their age group and sex group. Table 4 shows the chiq-square test for testing the relationship between age group and sex. We found there is a real relationship between age group and sex for Taiwanese aboriginal teachers in primary school so we should add their interaction as a model effect. The parameter for this effect quantifies that relationship.

Table 2 frequency table of age group

Age group	Frequency	Percent (%)
22-29	226	14.8
30-34	245	16.0
35-39	341	22.3
40-44	356	23.3
45-49	174	11.4
50-54	154	10.1
55 above	35	2.3
Total	1531	100.0

From the Table 5, it shows we have strong evidence that the ratio of the odds a 22-29 years old female aboriginal teachers in primary school to the odds male is

exp(1.280)=3.60; the ratio of the odds a 30-34 years old female aboriginal teachers in primary school to the odds male is exp(1.464)= 4.32; the ratio of the odds a 35-39 years old female aboriginal teachers in primary school to the odds male is exp(1.370)=3.94; the ratio of the odds a 40-44 years old female aboriginal teachers in primary to the odds male is exp(0.977)=2.66; the ratio of the odds a 45-49 years old female aboriginal teachers in primary to the odds male is exp(0.796)=2.22.

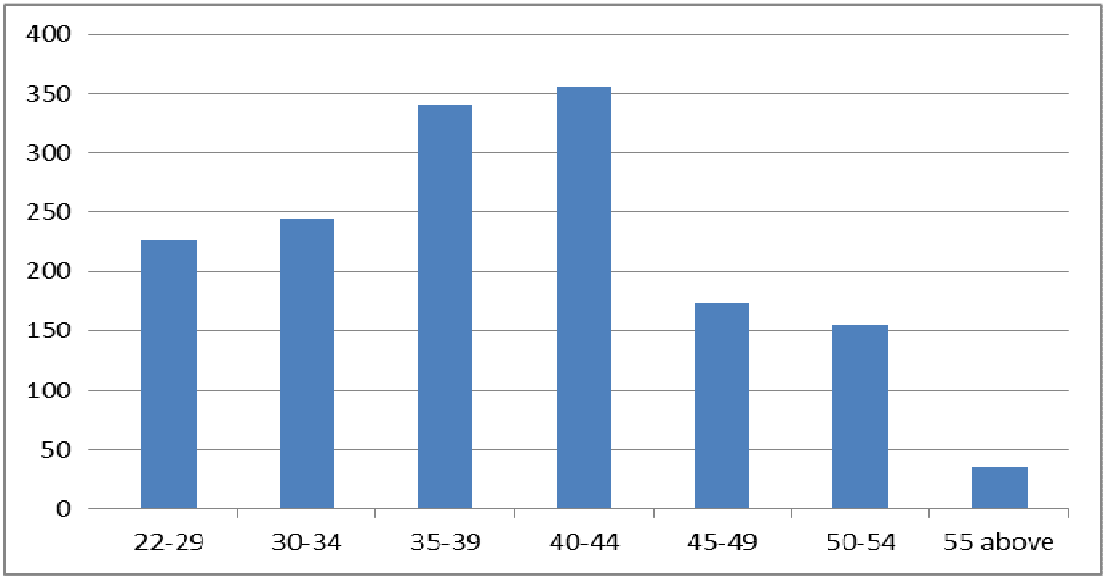

Figure 3. Bar graph of age group

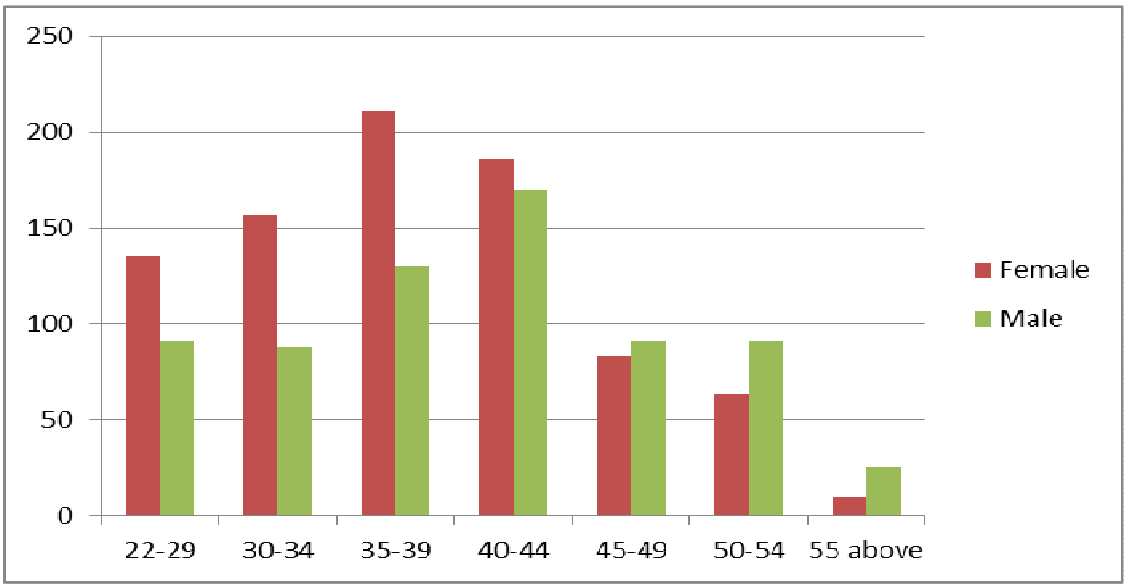

Figure 4. bar graph of age group and sex

Table 3. Frequency table of Sex by age group

	Sex				
	Female		Male		
Age group	No. of teacher	Percentage	No. of teacher	Percentage	Total
22-29	135	67.7%	91	32.3%	226
30-34	157	57.0%	88	43.0%	245
35-39	211	56.8%	130	43.2%	341
40-44	186	40.5%	170	59.5%	356
45-49	83	37.3%	91	62.7%	174
50-54	63	24.4%	91	75.6%	154
55 above	10	7.7%	25	92.3%	35
Total	845	----	686	-----	1531

Table 4 Cross table for age group and sex

		sex		
		Female	Male	Total
22-29	Count	135	91	226
	Expected Count	124.7	101.3	226.0
	% of Total	8.8%	5.9%	14.8%
30-34	Count	157	88	245
	Expected Count	135.2	109.8	245.0
	% of Total	10.3%	5.7%	16.0%
35-39	Count	211	130	341
	Expected Count	188.2	152.8	341.0
	% of Total	13.8%	8.5%	22.3%
40-44	Count	186	170	356
	Expected Count	196.5	159.5	356.0
	% of Total	12.1%	11.1%	23.3%
45-49	Count	83	91	174
	Expected Count	96.0	78.0	174.0
	% of Total	5.4%	5.9%	11.4%
50-54	Count	63	91	154
	Expected Count	85.0	69.0	154.0
	% of Total	4.1%	5.9%	10.1%
55 above	Count	10	25	35
	Expected Count	19.3	15.7	35.0
	% of Total	.7%	1.6%	2.3%
Total	Count	845	686	1531
	Expected Count	845.0	686.0	1531.0
	% of Total	55.2%	44.8%	100.0%

Table 5 Chi-square test for age group and sex

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	43.806[a]	6	.000
Likelihood Ratio	44.051	6	.000
Linear-by-Linear Association	34.326	1	.000
N of Valid Cases	1531		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.68.

Table 6 parameter estimates

					95% Confidence Interval	
Parameter	Estimate	Std. Error	Z	Sig.	Lower Bound	Upper Bound
Constant	3.239	.198	16.355	.000	2.851	3.627
22-29	1.278	.224	5.706	.000	.839	1.717
30-34	1.244	.225	5.536	.000	.804	1.685
35-39	1.633	.217	7.541	.000	1.208	2.057
40-44	1.900	.212	8.949	.000	1.484	2.316
45-49	1.278	.224	5.706	.000	.839	1.717
50-54	1.278	.224	5.706	.000	.839	1.717
55 above	0[a]	.	.	.	.	.
Female	-.887	.367	-2.420	.016	-1.606	-.169
Male	0[a]	.	.	.	.	.
[22-29] * [Female]	1.280	.391	3.275	.001	.514	2.046
[22-29] * [Male]	0[a]	.	.	.	.	.
[30-34] * [Female]	1.464	.390	3.753	.000	.699	2.228
[30-34] * Male]	0[a]	.	.	.	.	.
[35-39] * [Female]	1.370	.383	3.576	.000	.619	2.121
[35-39] * [Male]	0[a]	.	.	.	.	.
[40-44] * [Female]	.977	.382	2.560	.010	.229	1.725
[40-44] * [Male]	0[a]	.	.	.	.	.
[45-49] * [Female]	.796	.397	2.006	.045	.018	1.573
[45-49] * [Male]	0[a]	.	.	.	.	.
[50-54] * [Female]	.522	.401	1.300	.193	-.265	1.309
[50-54] * Male]	0[a]	.	.	.	.	.
[55 above] * [Female]	0[a]	.	.	.	.	.
55 above] * [Male]	0[a]	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Model: Poisson

c. Design: Constant + age group+ sex + age group* sex

CONCLUSIONS

Teachers are professionals and should meet the needs and give aboriginal students a better quality of education because aboriginal people have special culture and historical background. We need aboriginal teachers to improve aboriginal students their learning.

From the development of education historical context, the recipients of the educational experience vary by different race and class. Therefore the existing race and class issues of education become the focus for educators. In Western country, the major education system is increasingly being seen as important issue on the topics of education and race. This study aims to find the relationship between age group and gender of Taiwanese aboriginal teacher in primary school.

The results show the female primary school aboriginal teachers are more than male, which is 55.2% of total primary school Taiwanese aboriginal teachers.

There is a real relationship between age group and sex for Taiwanese aboriginal teachers in primary school. We have strong evidence that the female Taiwanese aboriginal teachers are more than male Taiwanese aboriginal teachers in primary school with age group 22-29 to 45-49. The highest percentage of primary school Taiwanese aboriginal teachers falls in the age group of 35 to 39 and teachers of 55 years old or above represent only 2.3% which is the lowest.

The retirement of public primary school teachers is divided into voluntary retirement and compulsory retirement. According to Article 4 to 6 under the Civil Service Retirement Act; the conditions for voluntary retirement are the teacher teaching more than 5 years and over 60 years of age, or 25 years of service. The conditions for compulsory retirement are teachers with more than 5 years of service and over 65 years old, or over 5 years of service and not competent for teaching due to mental or physical disadvantages. Therefore, the expected retirement ages are 50 to 54. In 2009, the average age of Taiwanese aboriginal teachers in primary school is 39 and each age group all have 150 above aboriginal teachers. Although we cannot immediately see the teacher retirement rate existing teacher supply which results in aboriginal teacher education gaps but to concern aboriginal students their learning equity and avoid teacher education gaps in the future, we suggest there is a need to make a long term planning on primary school aboriginal teacher education sufficient to support l aboriginal education in primary school.

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