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ARE NURSE WAGES TRULY HIGH IN JAPAN?[1]

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ABSTRACT

Currently, Japan is facing a rapid increase in its aging population and must take measures to address the issue. Because of the aging population, the demand for medical services is increasing. In order to respond to this increasing demand, an increase in the number of nurses seems to be essential. Generally, when the demand for nurses exceeds the supply of nurses, the wages offered to nurses must increase. In this paper, we firstly investigate whether the income of professionals and engineers, including include nurses, is higher than that of other occupations. Secondly, we analyze whether a nurse's income ranks high among those of professional workers and engineers in Japan. In the estimation results using an ordered probit model, we found that professional workers and engineers receive a high yearly income compared to other workers, but we cannot reject the hypothesis that there is no income difference between nurses and other professional workers and engineers.

Keywords: Nurse, Wages, Cross-Sectional Data, Ordered Probit Model

JEL Classification: C13, C21, J31

1. INTRODUCTION

The number of nurses in Japan was approximately 1,530,000 in 2015 and 93.7% of nurses are female.[2] In Japan, to become a registered nurse, after graduating high school, people attend

[1] The data for secondary analysis, the 2005 Social Stratification and Social Mobility Survey (The 2005 SSM Research Group, Data Management Committee), was provided by the Social Science Japan Data Archive, Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo.

[2] The data on the number of nurses is the sum of registered nurses and assistant nurses. This figure is quoted from the Japanese Nursing Association (2017) *Statistical Data on Nursing Service in Japan*. The ratio of female nurses is calculated from Ministry of Health, Labour and Welfare (2013) *Report on Public Health Administration and Services*.

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nursing school for three years and must pass the national nursing examination. To become an assistant nurse, after graduating junior high school, people attend nursing school for two years and must pass an examination conducted by the local government.[3]

Figure 1 shows the trend in the number of nurses and the number of elderly persons from 1965 to 2010. Recently, the aging population in Japan has increased and the number of those aged 65 and over exceeds 29,000,000, and their proportion is approximately 23% of the population. Elderly persons are liable to falling ill and they tend to go to the hospital. Naturally, as society ages, the demand for medical practitioners increases. On the other hand, although the number of nurses has shown a tendency to increase, it remained approximately 1,530,000 in 2015. Compared with the increase in the number of elderly persons, the supply of nurses is relatively small.

Further, we consider whether the average nurse income is relatively high using government statistics. Figure 2 shows a comparison between the average yearly income of the average female worker and that of a nurse. When we compare the average nurse income with that of the average female worker in the same age class, we can see that the average yearly income of a nurse is higher than that of the average female worker. Especially, from thirties to fifties, the income differences between nurses and the average female worker are large, amounting to approximately 1,000,000 yen. We can point out that the yearly income of a nurse is higher than that of average female worker.

[3] The Japanese Nursing Association explains that individuals have to receive instruction of over 3,000 hours (97 credits) in order to take the national nursing examination but individuals who want to take the assistant nurse examination only have to receive instruction of over 1,890 hours. However, there is a difference in work that can be done by a registered nurse and not by an assistant nurse.

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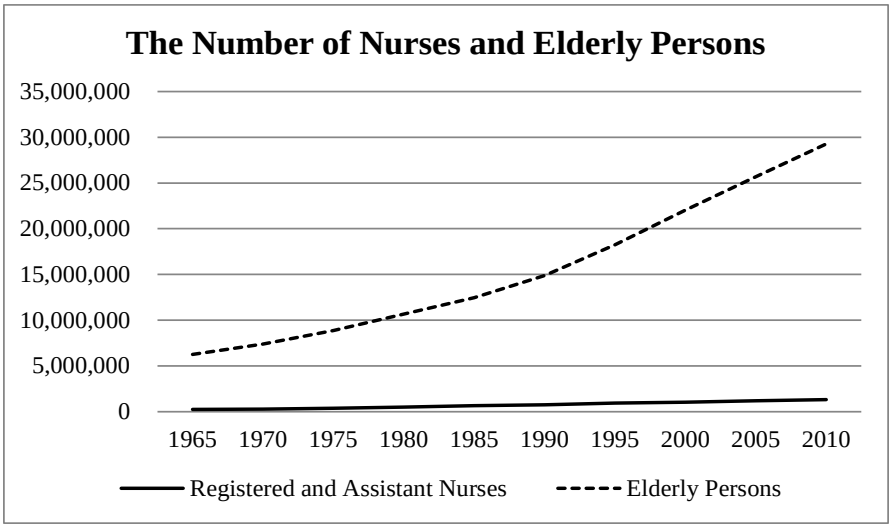
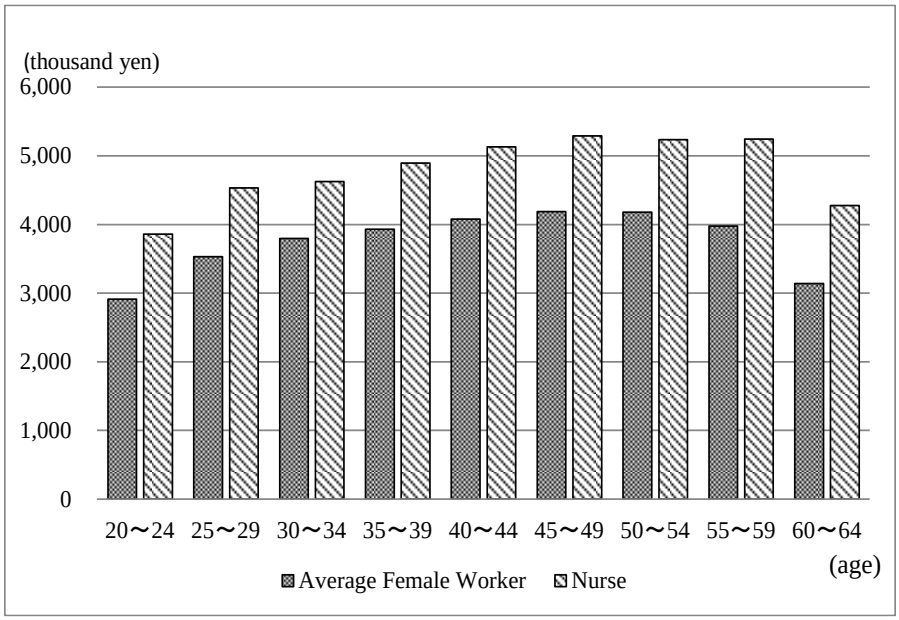
Figure 1: Trends in the number of nurses and elderly persons[4]



Source: Ministry of Health, Labour and Welfare (2013) *Report on Public Health Administration and Services*
Cabinet Office, Government of Japan (2016) *Annual Report on the Aging Society*

Figure 2: Yearly income comparisons by age group



Source: Ministry of Health, Labour and Welfare (2017) *Basic Survey on Wage Structure*

[4] Because of missing data in the number of nurses in 1985, 1995, and 2005, we use the data from 1986, 1996 and 2006, respectively, instead.

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Because of the low birthrate and the aging population, raising the number of nurses is imperative. However, working as a nurse requires passing the national nursing examination and the skills of a professional because the job description is sophisticated and specialized. Moreover, it cannot be said that their working conditions are good because their shift patterns are irregular and the actual working hours are long.[5] According to the Japanese Nursing Association (2012), the number of overtime hours in a given month, for rotating shift nurses in their twenties is as follows: the proportion of those with 20 to 29 hours of overtime is 18.8%, with 30 to 39 hours is 12.6%, and with 40 to 49 hours is 7.2%. Thus, many nurses work overtime.[6] Moreover, 87.7% of night-shift nurses in the two-shift system spend more than 16 hours at work, as compulsory working hours. Concerning leisure time, 44.3%, 59.7%, and 70.2% of nurses in their twenties, thirties, and forties, respectively, respond that "I do not have much leisure time" or "I have no leisure time." As one way to recruit talented workers for such a job, we can consider raising nurse wages.[7] From Figure 2, we can confirm that the yearly income of a nurse is indeed higher than that of the average female worker. However, these values do not take into account the effects of the working hours and the individual factors, such as education and firm size, and type of employment. When we control for the effects of the working hours on yearly income, or when we compare the income of nurses to that of professionals and engineers, the income of nurses may be not so high. If so, workers might not choose nursing as an occupation but might

[5] Omoto et al. (2006) reveal that the reasons for separation of nurses are dissatisfaction with working conditions (for example, their requests for the wage increase and the job rotation are not accepted) and tiredness and not enriching of private life because of work stress, using interview results of seven nurses who quit their job. Moreover, Japan Federation of Medical Workers' Unions (2014) points out that 35.4% of female nurses respond "my physical condition is very bad" or "physical condition is slightly bad," compared to the 17.1% of the overall industry female workers.

[6] Similarly, Japan Federation of Medical Workers' Unions (2014) reports that 90% of nurses work overtime; in a given month, 20.7%, 8.4%, and 1.7% of the overtime exceeds 20, 30, and 50 hours, respectively. Moreover, it points out that two-thirds of nurses experienced nonpayment of the wage in the past. The survey also asked in multiple choices about why they want to quit (which is selectable up to three) and it was revealed that 44.2% responded that "work is hard because of the nurse shortage"; the percentage that said "low wage" was 33.9%. Concerning overtime, the Japanese Trade Union Confederation Research Institute for Advancement of Living Standards (2013) points out similar problems.

[7] Tsunoda (1994) introduces theoretical models of dynamic shortage, shortage in the monopsonistic market, and shortage in the oligopsonistic market in the nurses' labor market. She explains these models with a labor supply curve of an upward slope. Kuroda and Yamamoto (2007) estimate the labor supply elasticity, especially Frisch elasticity, which represents change rates in labor supply when the wage increases marginally by 1%, using Japanese data. From the estimation results, they reveal that the Frisch elasticity of females is estimated to be from 1.3 to 1.5. Moreover, because these estimated values are the sum of two effects—one is the effect of changing the wage rate on the choice of working vs. not working, and the other is the effect of that on the work hours—they attempt to separate these two effects. Their finding is that the effect of changing the wage on the working hours is very small. From these results, they conclude that the effect of changing the wage on the labor supply is almost explained by the effect of that on the choice of working vs. not working. We take these results into account and assume that the labor supply curve has an upward slope.

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choose another occupation, such as those of other professionals and engineers.

For these reasons, in this paper we first investigate whether the income of professionals and engineers, including that of nurses is higher than that of other occupations. Next, we investigate whether the income of nurses is high compared to those of professional workers and engineers in Japan.

This paper is organized as follows: In Section 2, we discuss the relevant literature. The data and variables used in the estimations are described in Section 3. We show the estimation results in Section 4. Finally, Section 5 summarizes the major findings.

2. LITERATURE REVIEW

In this section, we review previous studies that have investigated the income of nurses and nurse shortage. Mennemeyer and Gaumer (1987) estimate the wage determination equation using the *1977 Sample Survey of Registered Nurses*. They examine whether the nurses with higher education receive a higher wage. One of their findings is that there is a more substantial premium paid to a small segment of nurses who hold a Master's degree. They conclude that employers and a large segment of nurses would not benefit from proposals requiring all nurses to obtain the baccalaureate degree.

Ahlburg and Mahoney (1996) study the decision to work and the decision to work as a nurse. They use micro data for their estimations and adopt a three-stage method as the estimation procedure.[8] From the results of taking into account bias and inconsistency, they reveal that a 10% increase in the wage offered to a nurse compared to the expected wage in her or his next-best occupation increases the probability that nurse will continue to work in the same profession by about 2%.

Sloan and Richupan (1975) investigate the effects of the nurses' hourly wage and the wage of nurses' spouse on nurses' labor supply. In their estimation results, they reveal that spouse's wage has a negative impact on the labor supply of married nurses. Moreover, they point out that the increase of hourly wage has a positive impact on the married nurses' labor supply but that its impact on the single nurses' labor supply seems to smaller. From their results, it can be said that the increase in the nurses' wage promotes the entry of new nurses in the labor market and increases the working hours of nurses.

[8] The first stage estimates two choice equations: work vs. not work, and work as a registered nurse vs. not. In the second stage, they estimate the wage equations. They use the fitted values of wages as endogenous variables in the structural occupational choice equation.

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The study that examines the thesis of monopsony power in the nurses' labor market is Hirsch and Schumacher (1995). From the point of view of a monopsony, when hospitals face an upward-sloping labor supply curve and possess monopsony power, a nurse shortage occurs. This is because hospitals choose the number of employees that balances their marginal revenue and marginal cost of labor, in order to maximize their profit. However, nurses' wages are decided based on the labor supply curve and not on the curve of the marginal cost of labor, and they are lower than those in a perfect competitive market. Moreover, the number of employees is also lower than that of the perfect competitive market and this leads to the nurse shortage. Hirsch and Schumacher (1995) tested the monopsony hypothesis using micro data and obtained the result that no support is found for the hypothesis of monopsony or oligopsonistic power in the nurses' labor market because there is no positive relationship between relative nursing wages and hospital density or market size.

Next, we introduce the studies which examine the nurses' labor market using Japanese data. Otsu (2005) estimates the wage equations of nurses using such data. She uses the *Basic Survey on Wage Structure* from 1980 to 2003 and compares its results with the estimation results of the wage equations for female nurses, assistant nurses, dietitians, pharmacists. The sample is divided into data for each occupation and each firm size, and the results show that the estimated coefficients of age and years of work are positive and statistically significant for all occupations. Moreover, she reveals that from 1980 to 2003, the income of nurses has been at the same level as that of pharmacists and that the income of nurses has never been less than that of pharmacists and dietitians. She also reports that the income of nurses has a tendency not to increase with age, as nurses quit their jobs. However, she uses aggregated data and only uses the mean values. Thus, these estimation results do not control for the individual characteristics factors.

Kawagoe (2009) calculates the prediction of supply and demand in the nurses' labor market. From his calculation results, the demand for nurses will be 1,580,000 in 2025, and the number of nurses should increase by an annual average of 26,000 starting in 2005. He argues that this can be obtained by keeping a balance of the new entries, reentries and turnover of nurses in the present conditions.

There are very few empirical studies on nurse wages in Japan. To shed some light on the shortage of nurses in Japan, we have to investigate whether the income of nurses is higher than that of other female workers after controlling for various factors. If the shortage of nurses is caused by the harsh treatment of nurses, such as offering a low wage, it might be improved through government policy. Thus, firstly, we analyze whether the income of professional workers and engineers, including nurses, is higher than that of other female workers. Subsequently, we examine whether the income of nurses is higher than that of other female

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professional workers and female engineers. In the next section, we explain the data and the estimation method used in our estimations.

3. METHODS

In this paper, we estimate the wage equations using Japanese micro data. For this study, we received the data of the 2005 Social Stratification and Social Mobility Survey (The 2005 SSM Research Group, Data Management Committee) from the Social Science Japan Data Archive, Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo. The national survey of Social Stratification and Social Mobility has been conducted every 10 years since 1955. The survey items include gender, age, job, educational attainment, and home environment. The 2005 SSM consisted of the people aged between 20 and 69 years old. The response rate and the number of respondents were 44.1% and 5,742, respectively.

As described above, most of the nurses in Japan are female. Thus, we only use female workers in our estimations. The collected sample size was 5,742, of which 3,082 were females. However, because many females do not work, our data comprised 1,204 individuals.

We used the income as a dependent variable because we estimate the wage equations. However, in the 2005 SSM, respondents were asked to choose a number between 1 and 30 that reflected the size of their yearly income.[9] Thus, we adopted the ordered probit model as the estimation method.

As independent variables, we used age, educational attainment, type of employment, firm size, working hours, a professional worker and engineer dummy variable, and a nurse dummy

[9] In more detail, the options for yearly income were as follows: (1) no income, (2) less than 250,000 yen, (3) from more than 250,000 yen to less than 500,000 yen, (4) from more than 500,000 yen to less than 750,000 yen, (5) from more than 750,000 yen to less than 1,000,000 yen, (6) from more than 1,000,000 yen to less than 1,250,000 yen, (7) from more than 1,2500,000 yen to less than 1,500,000 yen, (8) from more than 1,500,000 yen to less than 2,000,000 yen, (9) from more than 2,000,000 yen to less than 2,500,000 yen, (10) from more than 2,500,000 yen to less than 3,000,000 yen, (11) from more than 3,000,000 yen to less than 3,500,000 yen, (12) from more than 3,500,000 yen to less than 4,000,000 yen, (13) from more than 4,000,000 yen to less than 4,500,000 yen, (14) from more than 4,500,000 yen to less than 5,500,000 yen, (15) from more than 5,500,000 yen to less than 6,500,000 yen, (16) from more than 6,500,000 yen to less than 7,500,000 yen, (17) from more than 7,500,000 yen to less than 8,500,000 yen, (18) from more than 8,500,000 yen to less than 9,500,000 yen, (19) from more than 9,500,000 yen to less than 10,500,000 yen, (20) from more than 10,500,000 yen to less than 11,500,000 yen, (21) from more than 11,500,000 yen to less than 12,500,000 yen, (22) from more than 12,500,000 yen to less than 13,500,000 yen, (23) from more than 13,500,000 yen to less than 14,500,000 yen, (24) from more than 14,500,000 yen to less than 15,500,000 yen, (25) from more than 15,500,000 yen to less than 16,500,000 yen, (26) from more than 16,500,000 yen to less than 17,500,000 yen, (27) from more than 17,500,000 yen to less than 18,500,000 yen, (28) from more than 18,500,000 yen to less than 19,500,000 yen, (29) from more than 19,500,000 yen to less than 20,500,000 yen, and (30) more than 20,500,000 yen.

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variable.[10] Concerning educational attainment, we constructed a vocational school, junior college, university, and graduate school dummy variables. "Less than high school" was the reference category. For firm size, we used 6 categories. The reference category was "firm with fewer than 99 employees." Other categories were firm sized (1) from 100 to 299, (2) from 300 to 499, (3) from 500 to 999, (4) more than 1,000, and (5) government workers. To control the effects of type of employment on income, we used 5 categories. The reference category was "regular employment." Other types of employment were represented as follows: dummy variables for being a manager, part-time worker, temporary worker, and contract worker. Regarding working hours, we can obtain the information concerning the working hours per day and the working days per week or per month. From this information, we calculated the yearly working hours.[11] Table 1 below shows the descriptive statistics.

In our estimation, we only included female workers. When we excluded the individuals with missing values, 1,204 individuals remained. Concerning the yearly income, the maximum value was 27 (from more than 17,500,000 yen to less than 18,500,000 yen). The proportions of female workers with a vocational school, junior college, and university were 26.0%, 14.5%, and 11.0%, respectively. Further, very few workers had Master's degree. The proportion of part-time workers was 46.5%, but those of other types were relatively low. Thus, broadly speaking, we can divide the female workers into two types: the regular employees and the part-time workers. The average of the yearly working hours was 1832.9. The proportion of professional workers and engineers was about 20% and that of nurses among them was 28.2%.

[10] It would have been better to include "experience years in the labor market." However, the 2005 SSM data only provides starting and ending age of each individual's first job. Thus, we cannot include the variable of "experience years in the labor market."

[11] When we obtained the information about the working hours per day and the working days per week, the yearly working hours were calculated by the following equation: (working hours per day) × (working days per week) × (52 weeks). When we obtained the information about the working hours per day and the working days per month, the yearly working hours were also calculated as follows: (working hours per day) × (working days per month) × (12 months).

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Table 1: Descriptive Statistics

Variables	Observation	Mean	Std. Dev.	Min	Max
yearly income	1204	8.213	3.623	2	27
age	1204	44.375	12.218	20	69
square of age	1204	2118.3	1081.0	400	4761
vocational school dummy	1204	0.206	0.405	0	1
junior college dummy	1204	0.145	0.352	0	1
university dummy	1204	0.110	0.314	0	1
graduate school dummy	1204	0.006	0.076	0	1
firm size dummy (100－299)	1204	0.148	0.355	0	1
firm size dummy (300－499)	1204	0.053	0.224	0	1
firm size dummy (500－999)	1204	0.049	0.216	0	1
firm size dummy (more than 1000)	1204	0.112	0.316	0	1
government worker dummy	1204	0.088	0.283	0	1
manager dummy	1204	0.041	0.198	0	1
part-time worker dummy	1204	0.465	0.499	0	1
temporary worker dummy	1204	0.025	0.156	0	1
contract worker dummy	1204	0.035	0.184	0	1
yearly working hours	1204	1832.9	644.8	96	4680
professionals and engineers dummy	1204	0.200	0.400	0	1
nurse dummy	241	0.282	0.451	0	1

Next, we explain the estimation method. We used the following equation for estimation, where $\mathbf{Y_i^*}$ represents the yearly income (the latent variable) and $\mathbf{X'_i}$ is the vector of the independent variables, $\boldsymbol{\beta}$ is the vector of coefficients, $\mathbf{u_i}$ is error term, and "i" represents an individual:

$$\mathbf{Y_i^*} = \mathbf{X'_i}\boldsymbol{\beta} + \mathbf{u_i} \qquad (1)$$

Unfortunately, $\mathbf{Y_i^*}$ is unobservable, and we can only obtain the information on yearly income as the category number, which is an ordinal variable. Thus, we adopt an ordered probit model. This model is explained in Cameron and Trivedi (2005) as follows:[12]

Firstly, we define the ordered model with m values as follows:

$$y_i = j \quad \text{if } \alpha_{j-1} < Y_i^* \leq \alpha_j, \qquad (2)$$

where $\alpha_0 = -\infty$ and $\alpha_m = \infty$. When we represent Equation (2) as a probability, we can show the probability as in Equation (3).

[12] We quote Cameron and Trivedi (2005), pp.519-520, to introduce the ordered probit model.

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$$\Pr[y_i = j] = \Pr\left[\alpha_{j-1} < \mathbf{Y}_i^* \leq \alpha_j\right] = \Pr\left[\alpha_{j-1} < \mathbf{X'_i\beta} + \mathbf{u_i} \leq \alpha_j\right]$$
$$= \Pr\left[\alpha_{j-1} - \mathbf{X'_i\beta} < \mathbf{u_i} \leq \alpha_j - \mathbf{X'_i\beta}\right] = F[\alpha_j - \mathbf{X'_i\beta}] - F[\alpha_{j-1} - \mathbf{X'_i\beta}] \qquad (3)$$

where F is the cdf of $\mathbf{u_i}$. To estimate the model parameters, we maximize the following log-likelihood with respect to p_{ij}.

$$l = \ln L_N = \sum_{i=1}^{N}\sum_{j=1}^{m} y_{ij} \ln p_{ij}, \qquad p_{ij} = F_j(x_i, \beta) \qquad (4)$$

Because we assume that $\mathbf{u}$ follows a standard normal distribution and $F[\cdot]$ is the standard normal cdf, we apply the ordered probit model procedure to the estimations.

In the following section, we present the estimation results.

4. RESULTS

In this section, we show the estimation results. Firstly, we refer to the results of Table 2. All models use the categorical yearly income as a dependent variable. Model (1), (2), and (3) in Table 2 include all the female workers in the sample. Model (1) uses age, square of age, educational attainment, yearly working hours and the professionals and engineers dummy variables as independent variables. The coefficients of age and square of age are not statistically significant. Concerning the effects of educational attainment on yearly income, comparing the reference category of "less than high school" workers, it seems that worker with higher education receive higher incomes except for workers with graduate school education. Moreover, the more time workers spend at their jobs, the higher their yearly income becomes because the coefficient of the yearly working hours is positive and highly statistically significant. We also confirm that professionals and engineers earn higher incomes than other workers because the coefficient of the professionals and engineers dummy variable is positive and statistically significant at the 1% level.

Model (2) adds the firm size dummy variables to control for the effects of firm size on workers' income. We find that workers who are employed by a firm with many employees tend to receive high incomes. In Model (2), we also confirm that professionals and engineers receive a higher income.

We then also add type of employment as independent variables in Model (3). The reference category is "regular workers." Compared to the regular workers, the coefficient of the manager

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dummy variable is positive and slightly statistically significant at the 10% level. On the other hand, the coefficients of part-time worker, temporary worker, and contract worker are negative and highly statistically significant. Model (3) also shows that the coefficient of professionals and engineers dummy variable is again positive and statistical significant. Thus, we find that the occupations of professionals and engineers, which include nurses, yield a higher yearly income than that of workers in other occupations.

Table 2: Estimation results including all female workers

	Model (1)		Model (2)		Model (3)	
independent variables	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
age	0.0210	0.0169	0.0165	0.0171	0.0225	0.0178
square of age	-9.88×10^{-5}	0.0002	-3.21×10^{-5}	0.0002	-8.39×10^{-5}	0.0002
vocational school dummy	0.1966 **	0.0824	0.2123 ***	0.0830	0.0936	0.0838
junior college dummy	0.1958 **	0.0973	0.1459	0.0952	0.1191	0.0965
university dummy	0.5009 ***	0.1122	0.4016 ***	0.1168	0.2625 **	0.1123
graduate school dummy	0.4619	0.3399	0.3202	0.3724	0.3634	0.3398
firm size dummy (100－299)	—	—	0.1599 **	0.0794	0.1485 *	0.0840
firm size dummy (300－499)	—	—	0.2754 **	0.1245	0.3912 ***	0.1211
firm size dummy (500－999)	—	—	0.5316 ***	0.1401	0.5605 ***	0.1381
firm size dummy (more than 1000)	—	—	0.4739 ***	0.0982	0.4614 ***	0.1028
government worker dummy	—	—	0.6032 ***	0.1219	0.6394 ***	0.1150
manager dummy	—	—	—	—	0.4262 *	0.2245
part-time worker dummy	—	—	—	—	-1.2741 ***	0.0965
temporary worker dummy	—	—	—	—	-0.6098 ***	0.1841
contract worker dummy	—	—	—	—	-0.7981 ***	0.1899
yearly working hours	0.0012 ***	-6.4×10^{-5}	0.0012 ***	-6.5×10^{-5}	0.0008 ***	-6.8×10^{-5}
professionals and engineers dummy	0.6645 ***	0.0857	0.6403 ***	0.0871	0.4989 ***	0.0882
Number of obs	1204		1204		1204	
Pseudo R^2	0.1057		0.1142		0.1554	
Log pseudolikelihood	-2790.7227		-2764.0911		-2635.6937	

Note: Standard errors are robust.

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level

Next, we investigate whether the income of a nurse is higher than that of other professional workers and engineers, after controlling for the effects of firm size, type of employment and working hours. Table 3 shows the estimation results, which include only professional workers and engineers in the sample. The control variables in Models (1), (2), and (3) correspond to those in Models (4), (5), and (6), respectively. Concerning the effect of the nurse dummy variable on

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yearly income, all models show that the coefficient of the nurse dummy variable is positive but not statistically significant. Thus, the hypothesis that there is no income difference between nurses and other professional workers and engineers is not rejected.

Table 3: Estimation results including only professionals and engineers

	Model (4)		Model (5)		Model (6)	
independent variables	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
nurse dummy	0.1162	0.1982	0.0840	0.1990	0.1696	0.2056
age	0.0548	0.0414	0.0412	0.0428	0.0465	0.0465
square of age	-2.78×10^{-5}	0.0005	-1.18×10^{-4}	0.0005	-6.13×10^{-5}	0.0006
vocational school dummy	0.4565 **	0.2146	0.4172 *	0.2226	0.2628	0.2119
junior college dummy	0.4707 **	0.2165	0.4160 *	0.2169	0.4562 **	0.2110
university dummy	0.9489 ***	0.2072	0.8221 ***	0.2175	0.6889 ***	0.2143
graduate school dummy	0.8741 **	0.3922	0.6531 *	0.3710	0.6929 *	0.3595
firm size dummy (100－299)	—	—	0.1934	0.1928	0.2273	0.2196
firm size dummy (300－499)	—	—	0.4372	0.3098	0.4914 *	0.2862
firm size dummy (500－999)	—	—	0.5357 *	0.2855	0.5344 *	0.2900
firm size dummy (more than 1000)	—	—	0.6177 *	0.3392	0.8085 **	0.3934
government worker dummy	—	—	0.4253 **	0.1985	0.5035 ***	0.1944
manager dummy	—	—	—	—	1.3702 **	0.5548
part-time worker dummy	—	—	—	—	-0.9771 ***	0.2886
temporary worker dummy	—	—	—	—	-0.9049 **	0.3593
contract worker dummy	—	—	—	—	-1.0196 *	0.5257
yearly working hours	0.0015 ***	0.0001	0.0015 ***	0.0002	0.0012 ***	0.0002
Number of obs	241		241		241	
Pseudo R^2	0.1258		0.1337		0.1589	
Log pseudolikelihood	-571.23051		-566.06155		-549.63144	

Note: Standard errors are robust.

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level

From the results of all the models, we can see that the coefficient of working hours is positive and statistically significant throughout. Indeed, as Figure 1 shows, the income of a nurse is higher than that of the average female worker. However, this may be due to the fact that the working hours of nurses are long. From the survey of the nurses' working conditions, such as the one by the Japanese Nursing Association (2012), nurses are required to work overtime, and many nurses have no leisure time. However, the yearly income of nurses does not seem to be higher than that of other female professionals and engineers. If the working conditions of other professionals and engineers are more comfortable, people might prefer to choose another professional or engineering occupation over becoming a nurse. Moreover, the Japanese Nursing

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Association (2012) reports that among the respondents who are mainly night nurses and rotating shift nurses, 54.9&, 44.8%, and 32.9% of nurses in their twenties, thirties, and forties, respectively, consider resigning their current hospital jobs. Among the nurses who consider resigning from their current hospital jobs and want to work again as a nurse are 50.2%, 48.0%, and 42.9% are in their twenties, thirties, and forties, respectively. Thus, only about half the nurses who want to quit their current hospital jobs intend to be re-employed as a nurse.[13] By preserving the total current yearly income of nurses and by shortening their working hours, the working conditions are improved and the hourly wage increases. It might be important that the government enacts such a policy to secure the future of the nursing profession.

5. DISCUSSION

Presently, Japan faces a rapid increase in its aging population and must take measures to address the issue. Because of the aging population, the demand for medical services increases, and in order to respond to this increasing demand, an increase in the number of nurses seems to be essential. Generally, when the demand for nurses exceeds the supply of nurses, the wage offered to nurses must increase. Thus, we investigated whether the yearly income of a nurse is higher than that of other workers. Firstly, we analyzed whether the yearly income of professionals and engineers, including nurses, is higher than that of other workers. From the estimation results using an ordered probit model, we found that professionals and engineers receive a higher yearly income compared to other workers. Secondly, we also analyzed whether the yearly income of nurses is higher than those of other professionals and engineers. We concluded that we cannot reject the hypothesis that there is no income difference between nurses and other professionals and engineers.

As some previous surveys concerning the working conditions of nurses in Japan show, compulsory working hours for night-shift nurses are more than 16 hours, and the situation is worsened because many nurses are required to work overtime. Our estimation results show that the yearly working hours have a positive and statistically significant effect on yearly income, and this might be a reason why the income of nurses is higher than that of the average female worker. As a way to increase the labor supply of nurses, it is proposed that the wage of nurses increase. However, if there are other reasons why nurses quit their jobs, such as overtime work, long compulsory working hours, and no leisure time in everyday life, it is important to improve the working conditions in addition to increasing the wage of nurses.

In this paper, we mainly investigated the wage of nurses. However, we did not examine the

[13] The Japanese Trade Union Confederation Research Institute for Advancement of Living Standards (2013) observed a similar tendency.

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motivation of people applying to become nurses, or the reason for the current nurse turnover rate. The investigation of these topics will be a task for the future.

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