Implementing ordinal regression model for analyzing happiness level in Indonesia

N M Pratiwi¹ and Kismiantini²
¹,²Department of Mathematics, Faculty of Mathematics and Natural Science, Yogyakarta State University, Sleman, DIY, Indonesia
E-mails: nuraisyah.meitaswi@student.uny.ac.id; kismi@uny.ac.id

Abstract. Happiness can be an indicator of social progress achievement in developing a country. Understanding factors affecting the level of happiness in a country become important in the study of subjective well-being. This study aims to determine factors that influence happiness in Indonesia using the fifth wave of Indonesian Family Life Survey (IFLS) data. From the national data of 29,336 participants in 13 provinces were reported that 13.4% of the participants responded they were very happy, 78.6% were happy, 7% were unhappy, and 1% were very unhappy. Ordinal regression models in particular proportional odds models were implemented on analyzing factors of the four levels of happiness. The significant variables associated with happiness were age, marital status, job status, education, satisfaction, economic level, health, and religious variables. Sex, hopeful, personality, and social relation were not significantly associated with people’s happiness. Happy people have higher probabilities of happiness than others. Very happy appeared to have lower probabilities of happiness as their ages increasing, while in contrast to unhappy and very unhappy people.

1. Introduction
The development of a country can be measured based on the level of community welfare. The level of community welfare can be measured in two ways, using same standards (objective indicators) and using unequal standards (subjective indicators) [28]. One of the objective indicators can be measured based on economic growth and poverty reduction, but the assessment is considered inadequate to describe the real level of community welfare. Happiness index can be a good indicator for the community welfare even though it is measured by using unequal standards (subjective indicators).

Happiness is defined as the degree of an individual judges the overall quality of his/her life in positive manner. In this way, the happiness can be felt differently by each individual so there is possible subjectivity in the measurement. Several studies have been investigated factors which affect the level of happiness of a country. Oswald (1997) investigated happiness and economic performance in the developed nations [5]. Blanchflower and Oswald (2004) studied the relationships between income, sexual behavior, and happiness of adult Americans [14]. Alesina et al. (2004) studied the determinants of happiness based on the inequality level in society for Europeans and Americans [13]. Tokuda et al. (2010) investigated the relationship of individual-level and country-level social trust to individuals’ happiness in Asian countries [20]. Edington (2015) studied the determinants of subjective well-being (happiness) [16]. Sohn (2016) analyzed the relationship between height and happiness in Indonesia [30].
According to The World Happiness Report 2018, Finland is the happiest country in the world followed by Norway, Denmark, Iceland, and Switzerland. The top countries tend to have high values of the income, healthy life expectancy, social support, freedom, trust and generosity. The World Happiness Report showed the declining Indonesia’s happiness ranking in the last four years. In 2015, Indonesia was ranked 75th, 2016 was ranked 79th, 2017 was ranked 81th, and 2018 was ranked 96th from 156 countries [32].

Average happiness is higher in developed countries than in developing countries. One of explanation in the difference is freedom. Brulé and Veenhoven (2014) reported that the Finns are happier than the French because they have more freedom [25]. Miret et al. (2014) reported that health status is correlated to happiness in rich nations [26]. In Asian countries, Tokuda (2010) found that happiness were related to female gender, being age 20–29 years or 60–69 years, married, high income and education, students/retired/homemaker, religious belief, good health, and higher individual, and aggregate social trust [20]. In Indonesia, Rahayu (2016) studied that the determinants of happiness were associated with absolute income, relative income, education level, perceived health and some components of social capital such as willingness to help, tolerance, security, and importance of religion and religiosity in election [29].

In Indonesia, there is a national survey which contains data such as happiness, economic, health, social, and education. The survey is called the Indonesian Family Life Survey (IFLS). The IFLS data from 1993 to 2015 were conducted on households from 13 provinces in Indonesia include North Sumatra, West Sumatra, South Sumatra, Lampung, Jakarta, West Java, Central Java, D.I. Yogyakarta, East Java, Bali, West Nusa Tenggara, South Kalimantan, and South Sulawesi [31]. The happiness variable was categorized into four levels of very unhappy, unhappy, happy, very happy. A method which is useful for analyzing an ordinal response is an ordinal regression model. The ordinal logistic regression model is one of the logistic regression models which is used to analyze the relationship between a response variable and some explanatory variable, with the response variable have three or more categories in ordinal scale, if there are J category so the response levels can be arranged to be category 1 < category 2 < ... < category J [27].

Several studies have been conducted on applying the ordinal logistic regression in some disciplines. In health, Das and Rahman (2011) studied about the risk factors of child malnutrition in Bangladesh where the ordinal response variable has four levels of undernourished, moderately undernourished, and nourished [21]. The analysis results were reported that age of child, birth interval, mother’s education, maternal nutrition, household wealth status, child feeding index, and incidence of fever, ARI and diarrhoea were significant explanatory variables of child malnutrition. In psychology, Frangos et al. (2011) studied the relationship between problematic internet use (non-problematic Internet users (PIU), risk Internet users, and internet-addicted users) among university students in Greece. Their results showed that the PIU was significantly associated with gender, family condition, academic performance in the last semester of their studies, living with parents or not, enrollment in unemployment programs, having Internet connections [23]. In social sciences, Petkari and Tallo (2018) studied seven-scale of happiness which associated with sex, age, marital status, nationality, residence in United Arab Emirates [33].

In this study, we want to determine factors which influence to happiness in Indonesia. As a large country with majority populations is Muslim, it is interesting to explore the influence of strengths on happiness in Indonesia using the ordinal logistic regression model.

2. Methods
2.1 Data
Data were taken from the fifth wave of Indonesia Family Life Survey (IFLS) in 2014-2015. The IFLS 5 was conducted by Research and Development Coorporation (RAND Labor and Population) and SURVEY Meter. The sample was a representative of about 83% of the Indonesian populations in 13 provinces in the country between the ages of 14 and 101 years.
2.2 Measure
The outcome variable was a respondent’s happiness level (very unhappy, unhappy, happy, very happy). The explanatory variables examined in the study were selected based on previous studies that were adjusted to the IFLS 5 data included age, marital status, gender, job, education, satisfaction, economic level, health, religious, hopeful, personality, and social relation. The degree of happiness influenced by factors included: gender, age, marital status, health, employment status, education, religiosity, and personality [12, 8, 22, 18, 19].

The research had found that age [2, 6, 10], gender [18], marital status [5, 6], job [5], education [1, 18], economic level [5, 4], health [22, 3, 17], satisfaction [15, 11], hopeful [11], personality [16, 11], and social relations [11] as explanatory variables of happiness level. In this study, the variables of age is continuous variable and marital status, gender, job were binary variables. While education, satisfaction, economic level, health, religious, hopeful, personality, and social relations were ordinal variables.

2.3 Data Analysis
In this study, a total 29,336 respondents were used in the analysis. Descriptive statistics and ordinal logistic regression analysis were used to overview characteristics of the sample and to identify factors associated with happiness level. The logistic regression can be used to determine the relationship between one response variable in the form of categorical data (nominal or ordinal) and two or more explanatory variables. If the response variable in the form of ordinal data consisting of three or more categories, then the ordinal logistic regression model is a useful model to use in this relationship. In this study, the ordinal logistic regression model approach was carried out with the cumulative logit model or the proportional odds model. In particular, the proportional odds model is a special model that the logit of these cumulative probabilities is assumed to be changed linearly as the explanatory variables changes [27]. The proportional odds model is given as follows:

\[
\text{logit } P(Y \leq j | \mathbf{x}) = \beta_{j0} + \beta_1 x_1 + \cdots + \beta_p x_p
\]

where \( i = 1, 2, \ldots, n; j = 1, \ldots, J - 1 \); \( x_1, \ldots, x_p \) are the explanatory variables, \( \beta_{j0} \) is the \( j \) th intercept where so \( \beta_{10} < \cdots < \beta_{J-1,0} \), and \( \beta_1, \ldots, \beta_p \) are the regression parameters. Parameters in the ordinal logistic regression model can be estimated using a maximum likelihood estimation (MLE) method by maximizing the likelihood function [9].

A significant test of simultaneously explanatory variables on the response variable can be conducted using a by likelihood ratio test (LRT). The null hypothesis is the regression model without explanatory variables and the alternate hypothesis is at least one explanatory variable in the regression model. When the null hypothesis is rejected, it means that at least one explanatory variable has a significant effect on the response variable [9]. While, a Wald test can be used to test the single effect of the explanatory variable to the response variable. For example, age is the explanatory variable and happiness is the response variable, the hypotheses are as follows: (i) \( H_0 \): Happiness level and age are independent or unrelated (\( H_0 : \beta_p = 0 \)); and (ii) \( H_1 \): Happiness level and age are related or dependent on each other (\( H_1 : \beta_p \neq 0 \)). All data analyses in this study were performed using R software [27].

3. Results
3.1 Descriptive Statistics
Frequency and percentage distributions of the response and explanatory variables for categorical data in this study are shown in Table 1. Overall, the happiness level of the Indonesian is categorized in happy level. The Indonesian who are in happy category are 58.15% of married respondents, 41.88% of female, 47.27% with job, 27.83% with last education in senior high school, 49.22% somewhat healthy, 48.64% religious, 39.63% very hopeful, 51.23% very friendly and 53.93% good relation with others. While at the economic level, 39.08% of Indonesian at the economic level 3 are in happy category.
| Table 1. Frequency and percentage for the categorical explanatory variables. |
|-----------------------------|------------------|------------------|------------------|------------------|
| Variables                   | Very unhappy:    | Unhappy:         | Happy:           | Very happy:      |
|                             | [N=298]          | [N=2,039]        | [N=23,058]       | [N=3,941]        |
| **Marital Status**          |                  |                  |                  |                  |
| Unmaried                    | 102              | 735              | 6,000            | 894             |
| Married                     | 196              | 1,304            | 17,058 (58.15%)  | 3,047           |
| **Gender**                  |                  |                  |                  |                  |
| Male                        | 137              | 1,028            | 10,772           | 1,796           |
| Female                      | 161              | 1,011            | 12,286 (41.88%)  | 2,145           |
| **Job**                     |                  |                  |                  |                  |
| No                          | 129              | 792              | 9,190            | 1,562           |
| Yes                         | 169              | 1,247            | 13,868 (47.27%)  | 2,379           |
| **Education**               |                  |                  |                  |                  |
| Elementary school           | 174              | 1,076            | 6,794            | 1,003           |
| Junior High School          | 55               | 368              | 4,810            | 706             |
| Senior High School          | 55               | 477              | 8,163 (27.83%)   | 1,406           |
| University                  | 14               | 118              | 3,291            | 826             |
| **Satisfied**               |                  |                  |                  |                  |
| Not at all satisfied        | 74               | 108              | 230              | 53              |
| Not very satisfied          | 109              | 969              | 2,251            | 160             |
| Somewhat satisfied          | 65               | 640              | 11,055 (37.68%)  | 811             |
| Very satisfied              | 44               | 280              | 8,771            | 2,460           |
| Completely satisfied        | 6                | 42               | 751              | 457             |
| **Economic level**          |                  |                  |                  |                  |
| Level 1                     | 102              | 434              | 1,109            | 190             |
| Level 2                     | 76               | 653              | 3,918            | 469             |
| Level 3                     | 85               | 724              | 11,464 (39.08%)  | 1,597           |
| Level 4                     | 27               | 195              | 5,875            | 1,387           |
| Level 5                     | 3                | 27               | 537              | 220             |
| Level 6                     | 5                | 6                | 155              | 78              |
| **Health**                  |                  |                  |                  |                  |
| Unhealthy                   | 16               | 84               | 188              | 25              |
| Somewhat unhealthy          | 114              | 822              | 4,237            | 589             |
| Somewhat healthy            | 125              | 892              | 14,439 (49.22%)  | 2,247           |
| Very healthy                | 43               | 241              | 4,194            | 1,080           |
| **Religious**               |                  |                  |                  |                  |
| Not religious               | 24               | 137              | 499              | 90              |
| Somewhat religious          | 57               | 467              | 4,990            | 664             |
| Religious                   | 125              | 1,098            | 14,268 (48.64%)  | 2,119           |
| Very religious              | 92               | 337              | 3,301            | 1,068           |
| **Hopeful**                 |                  |                  |                  |                  |
| Not hopeful                 | 52               | 308              | 2,327            | 375             |
| Somewhat hopeful            | 53               | 386              | 3,978            | 650             |
| Hopeful                     | 66               | 416              | 5,126            | 762             |
| Very hopeful                | 127              | 929              | 11,627 (39.63%)  | 2,154           |
| **Personality**             |                  |                  |                  |                  |
| Not at all friendly         | 2                | 10               | 101              | 13              |
| Not very friendly           | 12               | 74               | 584              | 88              |
| Somewhat friendly           | 9                | 86               | 1,124            | 194             |
| Very friendly               | 177              | 1,329            | 15,029 (51.23%)  | 2,313           |
| Completely friendly         | 98               | 540              | 6,220            | 1,333           |
| **Social relation**         |                  |                  |                  |                  |
| Not at all good             | 1                | 12               | 101              | 13              |
| Not very good               | 14               | 72               | 588              | 86              |
| Somewhat good               | 12               | 97               | 1,245            | 205             |
| Good                        | 173              | 1,347            | 15,821 (53.93%)  | 2,474           |
Variables

| Variables        | Very unhappy: [N=298] | Unhappy: [N=2,039] | Happy: [N=23,058] | Very happy: [N=3,941] |
|------------------|-----------------------|---------------------|--------------------|-----------------------|
| Very good        | 98                    | 511                 | 5,303              | 1,163                 |

Age is the only continuous variable in this study. Figure 1 shows the relationship between happiness level and age based on the number of respondents. The average and median age were 36.57 and 34 years. The majority of respondents are 32 years old. The majority of respondents aged 32 years are in happy category. The happiness level of the Indonesian in happy category had sharply increased in the age between 20 to 35 years while gradually increased for very happy category. The happiness are decreasing after aged 36 years for both levels. Unhappy and very unhappy categories tend to be constant and experience decreasing pattern as age increased.

3.2. Ordinal Logistic Regression Analysis

To determine the effect of explanatory variables on the response variable, parameter tests were carried out. The LRT for testing $H_0: \beta_1 = \beta_2 = \cdots = \beta_p$ versus $H_1: \text{any } \beta_i \neq 0, i = 1, \ldots, p$ yields the Chi-Square of 5,611.4 and p-value < 0.0001 hence it can be concluded that at least one explanatory variable affect the happiness level. Table 2 shows the results of the wald test for each explanatory variable. The Wald test is used to test $H_0: \beta_r = 0$ versus $H_1: \beta_r \neq 0$, if the null hypothesis is rejected then the log-odds for each cumulative probability is larger or smaller with $x_r$ depending on the sign of $\beta_r$. The p-value of age variable is 0.000 which indicates that the age should be included in the model. The results of the Wald test on each explanatory variable yield 8 significant variables out of 12 explanatory variables.

Table 2. Wald test.

| Variable (category)  | t – value | p – value |
|----------------------|-----------|-----------|
| $X_1$ Age            | -17.747   | 0.000 *** |
| $X_2$ Marital Status (1) | 19.248 | 0.000 *** |
| $X_3$ Gender (1)     | -1.307    | 0.191     |
| $X_4$ Job(1)         | 2.083     | 0.037 *   |
| $X_5$ Education      |           |           |
| Junior High School (2) | 1.704 | 0.088 *   |
| Senior High School (3) | 5.985 | 0.000 *** |
| University (4)       | 10.217    | 0.000 *** |
| $X_6$ Satisfaction    |           |           |
| Not very satisfied (2) | 3.221 | 0.001     |
| Somewhat satisfied (3) | 15.377 | 0.000 *** |
| Very satisfied (4)   | 23.202    | 0.000 *** |
| Completely satisfied (5) | 25.911 | 0.000 *** |
Based on the Table 2, The p-value values of gender, hopeful, personality and social relation were larger than 0.05 then these variables do not affect the happiness level. While the significant effects to the happiness level in Indonesia can be obtained on the variables of age, marital status, job, education, satisfaction, economic level, health, religious, and personality less (all p-values are smaller than 0.05). Table 3 provides the coefficient, t statistic along with the corresponding p-value, and odds ratio for each explanatory variable.

Table 3. Estimation coefficient and odds ratio.

| Variable (category) | Coefficient | t value | p value | Odds Ratio |
|---------------------|-------------|---------|---------|------------|
| \(X_1\) Age         | 0.022       | -18.018 | 0.000 ***| 1.02       |
| \(X_2\) Marital Status (1) | -0.687     | 19.198  | 0.000 ***| 0.50       |
| \(X_4\) Job (1)     | -0.090      | 2.924   | 0.003 ** | 0.91       |
| \(X_5\) Education   |             |         |         |            |
| Junior High School (2) | -0.087     | 1.933   | 0.053    | 0.92       |
| Senior High School (3) | -0.270     | 6.575   | 0.000 ***| 0.76       |
| University (4)      | -0.537      | 10.824  | 0.000 ***| 0.58       |
| \(X_6\) Satisfaction|             |         |         |            |
| Not very satisfied (2) | -0.359     | 3.134   | 0.002 ** | 0.70       |
| Somewhat satisfied (3) | -1.726     | 15.255  | 0.000 ***| 0.18       |
| Very satisfied (4)   | -2.670      | 23.129  | 0.000 ***| 0.07       |
| Completely satisfied (5) | -3.341     | 25.842  | 0.000 ***| 0.04       |
| \(X_7\) Economic level |           |         |         |            |
| Level 2 (2)          | -0.569      | 8.480   | 0.000 ***| 0.57       |
| Level 3 (3)          | -0.845      | 13.318  | 0.000 ***| 0.43       |
| Level 4 (4)          | -1.143      | 16.854  | 0.000 ***| 0.32       |
In general, the probability of having higher happiness level increased significantly as the age increased (OR=1.02). Married respondents were reported to have lower the probability of having lower happiness level with unmarried respondents (OR=0.50). In the other words, that the married respondents were reported to have higher the probability of having higher happiness level with unmarried respondents (1/OR=1.99). Being employed in the formal or informal sectors was significantly associated with a lower probability of having happiness level compared to being unemployed (OR =0.91). Education was a significant explanatory variable of the happiness level, respondents who had attained junior high school (OR = 0.92), senior high school (OR = 0.76), and university (OR = 0.58) were associated with a lower probability of having lower happiness level compared to those with elementary school. Satisfaction was a significant explanatory variable of the happiness level, respondents who were in not very satisfied (OR=0.70), somewhat satisfied (OR=0.18), very satisfied (OR=0.07), and completely satisfied (OR=0.04) were reported to have lower the probability of having lower happiness level with not at all satisfied on their lives.

Overall, the economic level, health, and religious were significant explanatory variables of the happiness level. Respondents who were in the economic level 2 (OR=0.57), level 3 (OR=0.43), level 4 (OR=0.32), level 5 (OR=0.21), and level 6 (OR=0.18) were associated with a lower probability of having lower happiness level compared to those with the economic level 1. In the others words, it means respondents who have higher economic level will have higher the probability of higher happiness level. Respondents who were in somewhat unhealthy (OR=0.58), somewhat healthy (OR=0.41), and very healthy (OR=0.32) were reported to have lower the probability of having lower happiness level with unhealthy condition. In addition, respondents who were in somewhat religious (OR=0.71), religious (OR=0.67), and very religious (OR=0.42) were reported to have lower the probability of having lower happiness level with not religious.

Table 3 shows that the significant variables were age, marital status, job, education included: junior high school (2), senior high school (3), and university (4), satisfaction included: not very satisfied (2), somewhat satisfied (3), very satisfied (4), and completely satisfied (5), economic level included: level 2 (2), level 3 (3), level 4 (4), level 5 (5), and level 6 (6), health included: somewhat unhealthy (2), somewhat healthy (3), very healthy (4), and religious included: somewhat religious (2), religious (3), and very religious (4). Based on Table 3, the estimated of the proportional odd model can be written as follows

\[
\logit \left( \hat{P}(Y \leq j) \right) = \hat{\beta}_{10} + 0.022X_1 - 0.687X_{2(1)} - 0.090X_{4(1)} - 0.087X_{5(2)} - 0.270X_{5(3)} - 0.537X_{5(4)} - 0.359X_{6(2)} - 1.726X_{6(3)} - 2.670X_{6(4)} - 3.341X_{6(5)} - 0.569X_{7(2)} - 0.845X_{7(3)} - 1.143X_{7(4)} - 1.570X_{7(5)} - 1.718X_{7(6)} - 0.543X_{8(2)} - 0.889X_{8(3)} - 1.134X_{8(4)} - 0.345X_{9(2)} - 0.399X_{9(3)} - 0.869X_{9(4)}, \text{where } \hat{\beta}_{10} = -1.304, \hat{\beta}_{20} = 1.061, \text{and } \hat{\beta}_{30} = 6.344. \tag{2}
\]

Further interpretations of the estimated odds ratio for each explanatory variable are given in the following parts. The estimated odds of happiness being below a particular level change by 1.02 times for a 0.022 increase in age, holding the other variables. The possibility that the married respondents
(rather than the unmarried respondent) will have lower happiness level (very unhappy) of 0.05 times than those who have higher happiness level. The possibility that the respondent is working (rather than the respondent is not working) will have lower happiness level (very unhappy) of 0.91 times than those who have higher happiness level. The possibility that the respondents with the highest education of junior high school (than the respondents with the elementary school) will have lower happiness level (very unhappy) of 0.92 times than those who have higher happiness level. It is likely that the respondents with the highest education of senior high school (than the respondents with the elementary school) will have lower happiness level (very unhappy) of 0.76 times than those who have higher happiness level. Whereas the possibility that the respondents with the highest education of university (than the respondents with the elementary school) will have lower happiness level (very unhappy) of 0.58 times than those who have higher happiness level.

The possibility that the respondents with the not very satisfied (than the respondents with not at all satisfied) will have lower happiness level (very unhappy) of 0.70 times than those who have higher happiness level. It is likely that the respondents with the somewhat satisfied (than the respondents with not at all satisfied) will have lower happiness level (very unhappy) of 0.18 times than those who have higher happiness level. Whereas the possibility that the respondents with the very satisfied (than respondents with not at all satisfied) will have lower happiness level (very unhappy) of 0.07 times than those who have higher happiness level and the possibility that the respondents with the completely satisfied (than the respondents with not at all satisfied) will have lower happiness level (very unhappy) of 0.04 times than those who have higher happiness level.

The possibility that the respondents with the economic level 2 (than the respondents with economic level 1) will have lower happiness level (very unhappy) of 0.57 times than those who have higher happiness level. It is likely that the respondents with the economic level 3 (than the respondents with economic level 1) will have lower happiness level (very unhappy) of 0.43 times than those who have higher happiness level. Whereas the possibility that the respondents with the economic level 4 (than the respondents with economic level 1) will have lower happiness level (very unhappy) of 0.32 times than those who have higher happiness level. The possibility that the respondents with the economic level 5 (than the respondents with economic level 1) will have lower happiness level (very unhappy) of 0.21 times than those who have higher happiness level. While the possibility that the respondents with the economic level 6 (than the respondents with economic level 1) will have lower happiness level (very unhappy) of 0.18 times than those who have higher happiness level.

The possibility that the respondents with health conditions are somewhat unhealthy (than respondents with very unhealthy health conditions) will have lower happiness level (very unhappy) of 0.58 times than those who have higher happiness level. The possibility that the respondents with health conditions are somewhat healthy (than the respondents with very unhealthy health conditions) will have lower happiness level (very unhappy) of 0.41 times than those who have higher happiness level. While the possibility that the respondents with health conditions are very healthy (than respondents with very unhealthy health conditions) will have lower happiness level (very unhappy) of 0.32 times than those who have higher happiness level.

The possibility that the respondents with religious conditions are somewhat religious (than respondents with not religious) will have lower happiness level (very unhappy) of 0.71 times than those who have higher happiness level. The possibility that the respondents with religious (than respondents with not religious) will have lower happiness level (very unhappy) of 0.67 times than those who have higher happiness level. While the possibility that the respondents with very religious (than respondents with not religious) will have lower happiness level (very unhappy) of 0.42 times than those who have higher happiness level.

A better model is a model which has a minimal chance of error classification and high prediction accuracy than other models [9]. In this study, the accuracy of classification is conducted by using a linear discriminant analysis via a cross validation technique. Table 4 provides the results of classification using this technique.
Table 4. Accuracy of classification

| Observed   | Very unhappy | Unhappy | Happy    | Very happy | % accuracy |
|------------|--------------|---------|----------|------------|------------|
| Very unhappy | 74          | 85      | 132      | 7          | 24.83%     |
| Unhappy    | 108         | 677     | 1,238    | 16         | 32.20%     |
| Happy      | 230         | 913     | 21,495   | 420        | 93.22%     |
| Very happy | 53          | 63      | 3,460    | 365        | 9.26%      |

Table 4 shows that the accuracy of classification is 77.08% where 22,611 respondents from 29,336 respondents are correctly classified. As many 74 respondents very unhappy, 677 respondents unhappy, 21,495 respondents happy, and 365 respondents very happy are correctly classified. It means that the selected model obtained is a good model to classify the happiness level. Furthermore, since age is the only continuous variable and a significance to the happiness level, it is interested to determine the relationship between the happiness level and the age. An approximate probability plot of the happiness level and the age is given in Figure 2.

![Probability plot of happiness level and age](image)

Figure 2. Probability of happiness and age.

Figure 2 shows that happy people have higher probability of happiness than others. There is a slightly inverted U-shape in the happy category where a peak occurs at the 51 years. Very happy people appear gradually to decrease their probability of happiness while happy people show to decrease after around aged 51 years. Unhappy people appear rather sharply to increase their probabilities of happiness as age increasing. While very unhappy people have slightly increasing their probabilities of happiness as age increasing.

4. Conclusion

The proportional odds model was a good model for investigating the relationship factors affecting the happiness level. Eight explanatory variables of age, marital status, job, education, satisfaction, economic level, health, and religious are the important factors for the happiness level. Majority Indonesian were in the happy level. A slightly inverted U-shape appeared in the relationship between age and probability of being happy where the peak occurred at the aged 51 years. The probability of being happy is larger than others. The probability of being very happy decreased as age increased, while in contrast to the probability of being unhappy and very unhappy.
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