The Health Status of Labor Force in East Kalimantan Province: Effect of Individual Characteristics and Household Conditions

Status Kesehatan Angkatan Kerja di Provinsi Kalimantan Timur: Pengaruh Karakteristik Individu dan Kondisi Rumah Tangga

Jaka Eben Heizer¹,², Budiono¹, Ferry Hadiyanto³, Pipit Pritiyan³, Adiyatma Y. M. Siregar⁴

¹Master of Applied Economics, Department of Economics, Faculty of Economics and Business, Padjajaran University
²BPS-Statistics Indonesia, Kapuas Hulu Regency
³Center for Economics and Development Studies, Department of Economics, Faculty of Economics and Business, Padjajaran University

Correspondence: Jaka Eben Heizer
E-mail: jaka18003@mail.unpad.ac.id

Abstract

The aims of this research are first, to explore the factors that are associated with health status. Second, to address the individual characteristics and household conditions that affect the health status of labor force, taking into account the urban-rural differences. This research utilized data from SUSENAS Core 2018, and employed a cross sectional - multinomial logistic regression analysis method. The dependent variable is the health conditions of the labor force. The findings show that, age and number of household members were significant for both sick and very sick health status in all two type of areas analyzed. In urban and rural areas simultaneously gender, expenditure per capita, and drinking water were only significant for sick health group while marital status, education, employment status, sanitation, house area was only significant for very sick health status group. In urban areas, the results indicated that gender, employment status, and drinking water were only significant for sick health status group. In rural areas, the results indicated that gender, marital status, education, sanitation, and house area significant for very sick health status group. Moreover, in rural areas, marital status was only significant for sick health status whereas, sanitation and house area were significant for the very sick health status.

Keywords: Health Status, Determinants, Socioeconomic, Labor force, Individual Characteristics, Household Conditions, East Kalimantan Province.

Abstrak

Tujuan dari penelitian ini adalah pertama, untuk menyelidiki faktor-faktor yang berkaitan dengan kondisi kesehatan angkatan kerja. Kedua, untuk mengetahui faktor-faktor karakteristik individu dan kondisi rumah tangga mana saja yang mempengaruhi status kesehatan angkatan kerja dengan memperhatikan perbedaan perkotaan-perdesaan. Penelitian ini menggunakan data dari susenas kor 2018, dan menggunakan metode analisis regresi logistik multinomial - cross sectional. Variabel terikatnya adalah kondisi kesehatan angkatan kerja. Hasil penelitian menunjukkan bahwa umur dan jumlah anggota rumah tangga signifikan untuk status kesehatan sakit dan sangat sakit di ketiga jenis wilayah yang dianalisis. Di perkotaan dan perdesaan secara simultan gender, pengeluaran per kapita, dan air minum hanya signifikan untuk kelompok kesehatan sakit sedangkan status perkawinan, pendidikan, status pekerjaan, sanitasi, luas tempat tinggal hanya signifikan untuk kelompok status kesehatan sangat sakit. Di perkotaan, hasil penelitian menunjukkan bahwa jenis kelamin, status pekerjaan, dan air minum hanya signifikan untuk status kesehatan sakit, sedangkan status perkawinan, pendidikan, sanitasi, dan luas tempat tinggal signifikan untuk status kesehatan sangat sakit. Selain itu, di pedesaan, status perkawinan hanya signifikan untuk status kesehatan sakit sedangkan sanitasi dan luas tempat tinggal signifikan untuk status kesehatan sangat sakit.

Kata Kunci: Status Kesehatan, Determinan, Sosial Ekonomi, Angkatan Kerja, Karakteristik Individu, Kondisi Rumah Tangga, Provinsi Kalimantan Timur.
Introduction

Todaro and Smith (2015) stated that population growth (which will eventually increase the labor force) has traditionally been considered an essential factor to stimulate economic growth. That is, if the economic system can manage and administer these growing numbers. The increasing numbers of labor force need to be followed by an increase in productivity. Good health is needed to be economically productive. Hence, the economy of the region and country will gain benefit from having a large and healthy labor force. Past research has shown that individual characteristics and household conditions such as age, education, employment status, and household income affect the health of the labor force (Solar and Irwin, 2010). Furthermore, similar results were shown in a study conducted in Greece where certain demographic factors and socioeconomic factors are associated with greater morbidity and deterioration of people’s health status (Dimitris et al. 2013). It has also indicated that health conditions differ significantly between urban and rural areas (Wu et al. 2015). Besides, the Population Reference Bureau (2017) in their policy brief contends that, a long-term investment in human capital, such as education, health, and skill enhancement, plays a vital role in achieving sustainable economic development, where the role of the government as a policy maker is greatly needed.

East Kalimantan province is selected not only because of its economic contribution to the Indonesia’s economy but predominantly for its health complaints that had risen within the past six consecutive years. Moreover, for the last three years (2016 - 2018) the number became greater. According to BPS – Statistics Indonesia, in 2016, there were 21.76% (urban 22.29% and rural 20.80%) of East Kalimantan inhabitant who had health complaints in the last month (BPS-Statistics Indonesia, 2016). Subsequently, in 2017, there is some increase in health complaints that occurred in the last month, about 23.92% (urban 25.69% and rural 20.46%) of the East Kalimantan inhabitants (BPS-Statistics Indonesia, 2017). Again, in 2018, the number of inhabitants who had health complaints in the last month rise into 27.81% (urban 29.8% and rural 25.24%) in the same region (BPS-Statistics Indonesia, 2018).

Furthermore, the GRDP per capita of East Kalimantan were very high that is next to DKI Jakarta, but the annual growth rate is very low. East Kalimantan had the lowest GRDP per capita annual growth rate for five consecutive years (from 2014 to 2018) compared to those of other provinces which exhibits a negative value (-0.87). While DKI Jakarta on the other hand was 4 (positive) (BPS-Statistics Indonesia, 2018). This indicates the value of East Kalimantan GRDP had declined over years. Optimistically, the contribution of the East Kalimantan GRDP to Indonesian economy will be greatly enhanced if the health condition of East Kalimantan labor force is improved.

A person’s health condition which allows every person to live productively socially and economically can be seen from his health status. Health status can be measured directly or indirectly. The determination of status health directly, can be done through diagnosis / medical examination by medical practitioners (objective approach), whilst indirectly means that it can be seen through the perceptions of people that are being observed (subjective approach). Enhancement in socio-economic status, psychosocial factors and lifestyle can improve a person’s health status in the society. A study in China shows that a decent understanding of health determinants through individual characteristics, socioeconomics, and household conditions has good effect on public health policy (Cai et al. 2017). However, past studies seem to have not yet reached a final verdict pertaining factors that affecting a person’s health status. Some research findings even indicating opposing results. For example, Beckett and Elliott (2002) mention that there is a strong relationship between marital status and deterioration in health.
In their research, they find that people who never married are more likely to have poor health status compared to those who married. Married people have companions to share life’s difficulties and get support. Moreover, this does not vary much for widows, separated/divorced, and people who have never married at all. Conversely, another study showed different results. Trouble in marriage and certain stressful life events can enhance the risk of psychological distress which if prolonged can cause poor health status (Pearlin, 1989).

Further, it has long been noticed that education is one of crucial determinants of health. Canadian Institute for Health Information (2005) reports that education is related to one’s health status. Opportunities are widely open for people who have jobs, higher incomes, and higher education. Education equips people with the ability to deal with various life problems. Although many studies suggest that the level of education affects one’s health, one study argues that education is only an intermediate variable for health, and the effects of the level of education on someone’s health show non-significant result (Smith et al. 1998). Smith also concludes that education brings people to higher occupational class which led to higher income, and then eventually increase the chances of having good health. Another research conducted by Chandola (2006) also shows similar outcome wherein, the direct effect of education on health could not be proven to be significant in the study. However, it does not mean that education is a negligible factor for health. More example is the number of household members; large family size can affect the level of health of the entire family as income is generally divided amongst all family members. Therefore, this will have an impact on reducing the supply of nutritious food sources and the ability to pay medical services for each family member (Xu et al. 2003). However, the research conducted by Turagabeci et al. (2007), states that people who live alone or only with partners tend to be more susceptible to illness than those who they live in a larger family unit. In sum, these findings show inconclusive determinants of health from demographic and socioeconomic factors. Put differently, they are still open for discussion.

The aims of this research are twofold. First, to filter out factors affecting the health status. Second, to address the individual characteristics and household conditions that affect the health status of labor force, also considering the urban-rural differences.

**Method**

The data used in this research is obtained from the 2018 round National Socio-economic Survey (Survei Sosio-Ekonomi Nasional; henceforth SUSENAS) collected by Statistics Indonesia. For this paper, we used the Core Module of the 2018 SUSENAS, which has a sample comprises 5,083 households in 10 regencies/municipalities in East Kalimantan Province. As many as 5,642 people work in the urban areas whilst 3,471 workers reside in rural areas which bring total 9,113 people in the East Kalimantan labor force. The main sampling frame is 25% of 2010 Indonesia’s master frame population census (roughly 180,000 census blocks) which were drawn by means of Probability Proportional to Size (PPS) with the measurement of households from 2010 population census. Sample for SUSENAS province estimation, is derived from municipal estimation sub-sample and selected using two stages stratified sampling.

According to the International Labor Organization (ILO) the standard labor force concept divides the population into two groups, namely working age and nonworking age. The working age population are those whose 15 years old and over, whereas nonworking age group are people who aged 0-14 years old. Furthermore, the working population is classified into two major cohorts according to their current activities, those who are in the labor force and those who are not. Labor force is persons whose 15 years old and over who in the previous week were working,
temporarily absent from work but having job, or those who did not have work and were looking for work or in the process of establishing new business. Not in the labor force is persons aged 15 years and over, but not classified in the labor force, and are still attending school or housekeeping or conducting other activities other than personal activities. The categorization for each variable is shown in Table 1.

| Variables | Notation | Category                  |
|-----------|----------|---------------------------|
| Dependent Variable |          |                            |
| Labor Force Health Status | Y        | 0 = Very Sick               |
|                      |          | 1 = Sick                   |
|                      |          | 2 = Good                   |
| Independent Variables |          |                            |
| Gender               | $X_1$    | 0 = Female                 |
|                      |          | 1 = Male                   |
| Age                  | $X_2$    | 0 = 15-24 Y/o              |
|                      |          | 1 = 25-44 Y/o              |
|                      |          | 2 = 45+                    |
| Marital Status       | $X_3$    | 0 = Married                |
|                      |          | 1 = Never Married          |
| Education            | $X_4$    | 0 = $\geq$ High School    |
|                      |          | 1 = < High School          |
| Employment           | $X_5$    | 0 = Employed               |
|                      |          | 1 = Unemployed             |
| Household Conditions |          |                            |
| Number of household members | $X_6$ | 0 = 1-3 persons            |
|                      |          | 1 = $\geq$ 4 persons      |
| Household Expenditures Per Capita | $X_7$ | 0 = $\geq$ Rp. 574,704    |
|                      |          | 1 = < Rp. 574,704          |
| Drinking water       | $X_8$    | 0 = Improved               |
|                      |          | 1 = Unimproved             |
| Sanitation           | $X_9$    | 0 = Improved               |
|                      |          | 1 = Unimproved             |
| House area           | $X_{10}$ | 0 = $\geq$ 9 m²            |
|                      |          | 1 = < 9 m²                 |
| Variable Interaction |          |                            |
| Variable Interaction | $X_{11}$| 0 = Others                 |
| Never Married Male   |          | 1 = Never married Male     |
| Household Expenditures Per Capita | $X_{12}$ | 0 = Others |
| of labor Aged 25-44  |          | 1 = Labor aged 25-44       |

Frequently, If the measurement scale of dependent variables is ordinal then the model used would be ordinal logistic. However, ordinal logistic has robust assumption namely proportional odds assumption or parallel lines assumption which essentially means that the
The independent variable has the same effect on the odds of moving to a higher-order category everywhere along the scale, but this assumption is rarely met in real data (Kelly et al. 2017). Hence, this research is using multinomial logit regression.

**Variable measures**

The only dependent variable is the health status of the labor force (dependent variable) is categorized following the classification of health status in the study of 11 European countries (Verropoulou, 2009); the good health status is for labor force was not experiencing any health problems (health complaints) within one month ago; the sick health status is for labor force was experiencing health problems (health complaints) within one month ago but did not cause any disruption of job or daily activities; the very sick health status is for labor force was experiencing health problems (health complaints) within one month ago and caused disruption of jobs or daily activities.

Independent variables measured at the individual level include gender is categorized according Alonso et al. (1998) research: 0 is for female and 1 is for male, age is categorized based on Lam et al. (2020) study: (15-24; 25-44; 45+), marital status is divided based on Beckett and Elliott, (2002) research: 0 is for married, widowed, or divorced/ separated; 1 is for never married. Education is divided based on certificate held (Budiarti, 2004): greater than or equal to high school and below high school. Employment is divided based on Canadian Institute for Health Information (2005) report: employed and unemployed.

Number of household members is divided based on Nasution (1997) research: 1-3 and greater than or equal to 4 members. Total expenditure per capita (as proxies for income) is divided based on East Kalimantan Poverty Line (2019) which is (Rp. 574,704): greater than or equal to poverty line and below poverty line. Drinking water is categorized based on Statistics Indonesia (2018) report: 0 is for drinking water originating from the source of metered pipe drinking water, retail plumbing, well bore / pump, protected wells, and protected springs which has a distance to the nearest feces landfill ≥ 10 meters and 1 is for drinking water that sourced from branded drinking water, refill water, unprotected wells, unprotected springs, river water, rain water, etc. Sanitation follows Statistics Indonesia (2018) report categorized as: 0 is for improved sanitation if total sanitation score = 0 and 1 is for unimproved sanitation if total sanitation score > 0. Total sanitation score is calculated from: defecation facility + type of closet + feces landfill. Defecation facility is divided into two categories: 0 is for using private or mutual defecation facility and 1 is for using public defecation facility or not using any defecation facility. Type of closet is divided into two categories: 0 is for RCA latrine and 1 is for borehole latrine or pour-flush latrine or not using any type. Feces Landfill is divided into two categories: 0 is for tank / septic tank and 1 is for not tank / septic tank. Healthy living area according to ministry of public work is 36 m² for 4 household members (Kementerian PUPR, 2018), hence living area will be divided into: 0 is for per capita floor area ≥ 9 m² and 1 is for per capita floor area < 9 m².

Variable interaction of being male and never married is tested to predict the likelihood whether gender difference exist in association of never married or married at least once (Chung and Kim, 2015). Whilst, expenditure per capita in particular age group is investigated to observe the probability of worker living below poverty line in their prime working age to report poor health status (Dominick, 2018).

Durability of housing (along with drinking water, sanitation, and house area) is one of the important variables in determining whether the house is in a so-called slum area or not. But, since it demonstrates outlier data (no home with a bad durability) it will be excluded from this research.
**Multinomial Logit**

The advantage of using a multinomial logistic is that separate analysis can be carried out between sick, and very sick health status, where differ from the sick health status, the very sick health status can greatly affect labor force productivity. Moreover, all predictors were proven had significant difference towards health statuses (good, sick, and very sick) when tested using Pearson $\chi^2$ ($\alpha = 5\%$).

The general form of the login multinomial model is:

$$\ln \left( \frac{\pi_{ij}}{\pi_{ir}} \right) = X_{ij} \beta$$

Next, $\beta$ will be estimated using generalized least squares method and the maximum likelihood (ML) method (Agresti, 1996). The idea is to maximize the likelihood function from the random sample for estimating parameter. The likelihood function is expressed as follows:

$$L(\beta) = \prod_{i=1}^{n} \left[ \left\{ \pi_1(x_i) \right\}^{y_{1i}} \left\{ \pi_2(x_i) \right\}^{y_{2i}} \cdots \left\{ \pi_J(x_i) \right\}^{y_{Ji}} \right]$$

Where:

- $i = 1, 2, \ldots, n$. $n$ is random sample
- $J = 1, 2, \ldots, J$. $J$ the number of dependent variable category

From above equation, the ln-likelihood function can be constructed as follows:

$$\ln L(\beta) = \sum_{i=1}^{n} \left( y_{1i} \ln \pi_1(x_i) + y_{2i} \ln \pi_2(x_i) + \cdots + y_{Ji} \ln \pi_J(x_i) \right)$$

From this ln-likelihood function we can have derivative on $\beta_0 \leq \beta_{01} \leq \cdots \leq \beta_{0j-1}$, and $\beta$. As we know that parameter estimation with MLE method is to do a partial derivative on ln-likelihood towards parameters to be estimated. However, the ln-likelihood first partial derivative towards parameters to be estimated is nonlinear function. The parameter estimation from the nonlinear regression equation is complicated especially if the maximum likelihood method is used. Therefore, a numerical method is needed to attain the parameter estimation (Hosmer and Lemeshow, 2000). The numerical method employed is the Newton-Raphson method. There are two test employed in measuring the significance of the parameters, which are: Likelihood ratio test and Wald Test statistics.

The odds ratio is a measure of association which has found wide use, especially in epidemiology, as it approximates how much more likely (or unlikely) it is for the outcome to be present among those with $x = 1$ than among those with $x = 0$. For example, if $y$ denotes the presence or absence of lung cancer and if $x$ denotes whether the person is a smoker, then $\hat{OR} = 2$ estimates that lung cancer is twice as likely to occur among smokers than among nonsmokers in the study population. If the estimated odds ratio is $\hat{OR} = 0.5$, then occurrence of lung cancer is one half as likely to occur among those who exercise than among those who do not in the study population (Hosmer and Lemeshow, 2000).
| Characteristics and Conditions | East Kalimantan | Urban | Rural | \( \chi^2 \) | Min | Max |
|--------------------------------|----------------|-------|-------|---------------|-----|-----|
| **Independent Variable**      |                |       |       |               |     |     |
| **Health Status**              |                |       |       |               |     |     |
| Very Sick                      | 935 (0.10)     | 514 (0.09) | 421 (0.12) | 0  | 2  |
| Sick                           | 1,272 (0.14)   | 844 (0.15) | 428 (0.12) | 0  | 2  |
| Good                           | 6,906 (0.76)   | 4,284 (0.76) | 2,622 (0.76) | 0  | 2  |
| **Dependent variables**        |                |       |       |               |     |     |
| Gender                         | ***            |       |       |               |     |     |
| Female                         | 3,115 (0.34)   | 2,017 (0.36) | 1,098 (0.32) | 0  | 1  |
| Male                           | 5,998 (0.66)   | 3,625 (0.64) | 2,373 (0.68) | 0  | 1  |
| Age (years)                    | ***            |       |       |               |     |     |
| 15 - 24                        | 1,317 (0.14)   | 843 (0.15) | 474 (0.14) | 0  | 1  |
| 25 - 44                        | 4,640 (0.51)   | 2,957 (0.52) | 1,683 (0.48) | 0  | 1  |
| 45+                            | 3,156 (0.35)   | 1,842 (0.33) | 1,314 (0.38) | 0  | 1  |
| Marital Status                 | ***            |       |       |               |     |     |
| Married                        | 7,265 (0.80)   | 4,429 (0.79) | 2,836 (0.82) | 0  | 1  |
| Never been married             | 1,848 (0.20)   | 1,213 (0.21) | 635 (0.18) | 0  | 1  |
| Education                      | ***            |       |       |               |     |     |
| \( \geq \) High school        | 4,861 (0.53)   | 3,554 (0.63) | 1,307 (0.38) | 0  | 1  |
| < High school                  | 4,252 (0.47)   | 2,088 (0.37) | 2,164 (0.62) | 0  | 1  |
| Employment                     | ***            |       |       |               |     |     |
| Unemployed                     | 538 (0.06)     | 368 (0.07) | 170 (0.05) | 0  | 1  |
| Employed                       | 8,575 (0.94)   | 5,274 (0.93) | 3,301 (0.95) | 0  | 1  |
| Number of household members    |                |       |       |               |     |     |
| 1-3                            | 2,868 (0.31)   | 1,789 (0.32) | 1,079 (0.31) | 0  | 1  |
| \( \geq \) 4                   | 6,245 (0.69)   | 3,853 (0.68) | 2,392 (0.69) | 0  | 1  |
### Findings

**Distribution of variables**

Table 2 exhibits the descriptive statistic for the study variables. Pearson’s Chi-square test was used to compare mean differences and frequency distributions between predictors in urban and rural areas. Two variables were not significant; number of household members and house area, which indicate that there was no significant difference between rural and urban areas in influencing the health status of the labor force.

The total of 9,113 labor force consist of 5,642 (61.9%) that reside in the urban areas and 3,471 (38.1%) that live in the rural areas. The rural areas had a greater proportion of a very sick health status which was 12% of the labor force compared to that of urban areas with only 9%. On the contrary, urban areas had comparatively larger share on the sick health status which was 15% of the labor force than in rural areas with 12%.

In urban areas, labor force was dominated with male 64%, aged 25-44 y/o 52%, married 79%, had high school and above education 63%, and was employed 93%. Moreover, the majority

| Characteristics and Conditions | East Kalimantan | Urban | Rural | \( \chi^2 \) | Min | Max |
|---------------------------------|-----------------|-------|-------|----------|-----|-----|
| **Household Expenditure per capita** | | | | | | |
| ≥ Poverty line | 8,621 | 0.95 (0.22) | 5,435 | 0.96 (0.18) | 3,186 | 0.92 (0.27) | 0 | 1 |
| < Poverty line | 492 | 0.05 (0.22) | 207 | 0.04 (0.18) | 285 | 0.08 (0.27) | 0 | 1 |
| **Drinking Water** | | | | | | |
| Improved | 8,000 | 0.88 (0.32) | 5,473 | 0.97 (0.17) | 2,527 | 0.73 (0.44) | 0 | 1 |
| Unimproved | 1,113 | 0.12 (0.32) | 169 | 0.03 (0.17) | 944 | 0.27 (0.44) | 0 | 1 |
| **Sanitation** | | | | | | |
| Improved | 7,053 | 0.77 (0.41) | 4,906 | 0.87 (0.33) | 2,147 | 0.62 (0.48) | 0 | 1 |
| Unimproved | 2,060 | 0.23 (0.41) | 736 | 0.13 (0.33) | 1,324 | 0.38 (0.48) | 0 | 1 |
| **House area** | | | | | | |
| ≥ 9 m² | 7,776 | 0.85 (0.35) | 4,817 | 0.85 (0.35) | 2,959 | 0.85 (0.35) | 0 | 1 |
| < 9 m² | 1,337 | 0.15 (0.35) | 825 | 0.15 (0.35) | 512 | 0.15 (0.35) | 0 | 1 |
| **Variable Interaction** | | | | | | |
| Never married × Male | 541 | 0.06 (0.23) | 391 | 0.07 (0.25) | 150 | 0.04 (0.20) | *** | 0 | 1 |
| < Poverty line × Age 25-44 | 244 | 0.03 (0.16) | 105 | 0.02 (0.13) | 139 | 0.04 (0.19) | *** | 0 | 1 |

Pearson Chi-Square test; Differences between urban and rural residents were significant at *\( P < .01 \), **\( P < .05 \), and ***\( P < .001 \)
of labor force household conditions were living with greater than or equal to 4 family members 68%, had greater than or equal to poverty line expenditure per capita 96%, utilized improved drinking water 97%, had improved sanitation 87% and resided in greater than or equal to 9m² housing area 85%. In the rural areas, the majority of the labor force individual characteristics were male 68%, aged 25-44 y/o 48%, married 82%, had lower education level which was below high school 62%, and was employed 95%. In addition, the labor force household condition was dominated with living alongside greater than or equal to 4 family members 69%, had greater than or equal to poverty line expenditure per capita 92%, used improved drinking water 73%, had improved sanitation 62% and dwelled in greater than or equal to 9m² living space 85%.

Table 3. Shows the test for the proportional odds assumption and gives corresponding chi-square p-value. The p-value is proven to be significant, then the proportional odds assumption is violated and a traditional cumulative logistic regression should not be run, the model will typically run as a multinomial logistic regression.

| Table 3. Test For The Proportional Odds Assumption |
|--------------------------------------------------|
| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
| Null Hypothesis | 2007.291 | | | |
| General | 1953.118 | 54.173 | 13 | .000 |

Table 4 and 5 shows the likelihood ratio chi-square test compares the full model (containing all independent variables) against a null (no independent variable or intercept only). Statistical significance proves that the full model represents a significant improvement in fit over null model: \( \chi^2(28) = 413.912, p < .001 \).

| Table 4. Likelihood Ratio Chi-Square Test |
|--------------------------------------|
| Model Fitting Criteria | Likelihood Ratio Tests |
| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
| Intercept Only | 2361.836 | | | |
| Final | 1947.923 | 413.912 | 28 | .000 |

| Table 5. Goodness-of-Fit |
|--------------------------|
| Chi-Square | df | Sig. |
| Pearson | 1110.651 | 1102 | .582 |
| Deviance | 932.337 | 1102 | 1.000 |

Determinants of Labor Force’s Health Status
Multinomial logit regression present outputs for the 10 potential predictors plus 2 variable interactions for the sick and very sick health status with good health status as reference category. Table 6 provides result for East Kalimantan province, predictors that showed highly significant at 99% CI (confidence interval) in influencing the very sick health status were age 45+, number of household members and sanitation. Furthermore, marital status, education, and house area were significant at CI = 95%. Meanwhile, employment status and one variable interaction of never married male also significant at lower level of CI = 90%. Pertaining to sick health status, predictors like age 45+, number of household members, and drinking water were highly significant at CI = 99%, while gender, age 25-44 and expenditure per capita were significant at CI=95%. Roughly all predictors had a weight on either the sick or very sick health status. Yet, one predictor that does not show significant results, namely the interaction variable of aged 25-44 with below poverty expenditure.
Table 6. Multinomial Regression Analyses in East Kalimantan Province

| Health Statusa | Sick β | Std. Error | Odds Ratio | Very Sick β | Std. Error | Odds Ratio |
|---------------|--------|------------|------------|-------------|------------|------------|
| Intercept     | -1.92  | 0.19       |            | -2.64       | 0.25       |            |
| Gender (male = 1) | -0.21** | 0.07 | 0.80 | -0.07 | 0.08 | 0.92 |
| Age (25-44 = 1)   | 0.29** | 0.12 | 1.34 | 0.13 | 0.15 | 1.14 |
| Age (45+ = 1)     | 0.82*** | 0.13 | 2.27 | 0.87*** | 0.16 | 2.40 |
| Marital Status (never married = 1) | -0.05 | 0.11 | 0.94 | -0.36** | 0.15 | 0.69 |
| Education (below high sch. = 1) | -0.05 | 0.06 | 0.94 | 0.18** | 0.07 | 1.19 |
| Employment Status (employed = 1) | 0.17 | 0.15 | 1.19 | 0.33* | 0.20 | 1.39 |
| Household Members (>4 = 1) | -0.30*** | 0.06 | 0.73 | -0.32*** | 0.07 | 0.72 |
| Expenditure Per Capita (below poverty = 1) | -0.46** | 0.23 | 0.62 | 0.10 | 0.20 | 1.11 |
| Drinking Water (unimproved = 1) | -0.35*** | 0.10 | 0.70 | 0.09 | 0.10 | 1.09 |
| Sanitation (unimproved sanitation = 1) | 0.11 | 0.07 | 1.12 | 0.47*** | 0.08 | 1.60 |
| House area (< 9 m² = 1) | 0.04 | 0.09 | 1.04 | -0.31** | 0.11 | 0.73 |
| Marital Status × Gender (never married male= 1) | 0.08 | 0.17 | 1.08 | 0.37* | 0.22 | 1.45 |
| Expenditure × Age (below poverty × age 25-44 = 1) | 0.21 | 0.32 | 1.23 | -0.09 | 0.31 | 0.91 |

*P < .01, **P < .05, ***P < .001.

Table 7 presents output for the sick health status, predictors which highly significant at 99% CI in urban areas are age 45+ and number of household members. Whilst, gender and drinking water are significant at CI 95%. The employment status, was merely significant CI 90%. In the rural areas, age 45+ and number of household members shows highly significant result at CI 99%. Whereas, marital status and age 25-44 were significant at CI 95% and 90% consecutively. Despite several predictors behave differently in urban and rural areas, some even showing...
insignificant results, by and large all predictors are proven to have influence in the sick health status. To summarize, for the sick health status all predictors are contributing in the deterioration of labor force’s health status at different areas.

Table 7. Multinomial Regression Analyses for the Sick Health Status

| Health Statusa | Urban | | Rural | | 95% CI | 95% CI |
|----------------|-------|---|-------|---|---|---|
| Intercept      | -1.95 | 0.24 | -1.80 | 0.37 |
| Gender (male = 1) | -0.26** | 0.09 | 0.76 (0.65-0.91) | -0.10 | 0.11 | 0.89 (0.71-1.13) |
| Age (25-44 = 1) | 0.20 | 0.15 | 1.22 (0.92-1.64) | 0.47* | 0.25 | 1.61 (0.99-2.64) |
| Age (45+ = 1) | 0.76*** | 0.16 | 2.14 (1.57-2.92) | 0.92*** | 0.26 | 2.52 (1.51-4.22) |
| Marital Status (never married = 1) | 0.10 | 0.14 | 1.11 (0.84-1.47) | -0.45** | 0.22 | 0.63 (0.41-0.99) |
| Education (below high sch. = 1) | -0.01 | 0.08 | 0.98 (0.84-1.16) | -0.08 | 0.11 | 0.92 (0.74-1.15) |
| Employment Status (employed = 1) | 0.31* | 0.19 | 1.36 (0.95-1.97) | -0.21 | 0.29 | 0.80 (0.45-1.44) |
| Household Members (>4 = 1) | -0.26*** | 0.08 | 0.77 (0.66-0.90) | -0.37*** | 0.11 | 0.68 (0.55-0.86) |
| Expenditure Per Capita (below poverty = 1) | -0.39 | 0.37 | 0.67 (0.33-1.38) | -0.46 | 0.30 | 0.62 (0.35-1.14) |
| Drinking Water (unimproved = 1) | -0.92** | 0.32 | 0.39 (0.21-0.75) | -0.17 | 0.12 | 0.84 (0.66-1.07) |
| Sanitation (unimproved sanitation = 1) | 0.16 | 0.12 | 1.17 (0.93-1.48) | 0.17 | 0.11 | 1.18 (0.95-1.48) |
| House area (< 9 m² = 1) | -0.06 | 0.12 | 0.93 (0.74-1.18) | 0.23 | 0.15 | 1.25 (0.93-1.72) |
| Marital Status × Gender (never married male = 1) | -0.02 | 0.20 | 0.97 (0.66-1.45) | 0.14 | 0.38 | 1.15 (0.55-2.45) |
| Expenditure × Age (below poverty × age 25-44 = 1) | 0.30 | 0.48 | 1.35 (0.53-3.45) | 0.04 | 0.44 | 1.04 (0.44-2.48) |

*P < .01, **P < .05, ***P < .001

Table 8 showed outcome for the very sick health status, predictors that highly significant (CI 99%) in urban and rural areas were sanitation. Further, in urban areas, age 45+, marital status, education, number of household members and both variable interactions were significant at CI 95%. Meanwhile, in rural areas, age 45+ and number of household members were greatly significant at CI 99% then, age 25-44 y/o and house area were significant at comparatively
lower level (CI 90%). Despite many earlier studies had presented findings that suggest the importance of contributing variables in influencing health status, variables such as gender, employment status, expenditure per capita, and drinking water had no significant association regarding health status in this particular research.

In East Kalimantan Province, the female labor force had more chance of having sick health status compared to that of male labor force, the condition was similar to urban areas. Further, labor force aged 25-44 years old was more likely to have sick health status compared to that of aged

### Table 8. Multinomial Regression Analyses for the Very Sick Health Status

| Health Status* | Urban | | | Rural | | |
|----------------|-------|-------|-----------------|-------|-------|-----------------|
|                | β     | SE    | OR 95% CI       | β     | SE    | OR 95% CI       |
| Intercept      | -2.43 | 0.30  |                  | -2.98 | 0.46  |                  |
| Gender (male = 1) | -0.07 | 0.10  | 0.92 (0.75-1.14) | -0.05 | 0.12  | 0.94 (0.75-1.20) |
| Age (25-44 = 1) | -0.03 | 0.19  | 0.96 (0.66-1.41) | 0.46* | 0.27  | 1.58 (0.93-2.69) |
| (45+ = 1)      | 0.60**| 0.20  | 1.82 (1.23-2.71) | 1.33***| 0.27  | 3.79 (2.20-6.55) |
| Marital Status (never married = 1) | -0.57**| 0.20  | 0.56 (0.38-0.84) | -0.11 | 0.22  | 0.89 (0.58-1.39) |
| Education (below high sch. = 1) | 0.25**| 0.09  | 1.28 (1.06-1.56) | 0.02 | 0.11  | 1.02 (0.82-1.29) |
| Employment Status (employed = 1) | 0.25  | 0.24  | 1.28 (0.80-2.06) | 0.49 | 0.38  | 1.64 (0.77-3.51) |
| Household Members (>4 = 1) | -0.25**| 0.10  | 0.77 (0.64-0.94) | -0.39***| 0.11  | 0.67 (0.54-0.84) |
| Expenditure Per Capita (below poverty = 1) | 0.45  | 0.29  | 1.57 (0.88-2.83) | -0.15 | 0.27  | 0.85 (0.50-1.46) |
| Drinking Water (unimproved = 1) | 0.17  | 0.23  | 1.19 (0.75-1.90) | 0.01 | 0.11  | 1.01 (0.80-1.28) |
| Sanitation (unimproved sanitation = 1) | 0.50***| 0.13  | 1.65 (1.28-2.13) | 0.43***| 0.11  | 1.54 (1.24-1.92) |
| House area (< 9 m² = 1) | -0.28* | 0.15  | 0.74 (0.55-1.01) | -0.31* | 0.18  | 0.72 (0.51-1.05) |
| Marital Status × Gender (never married male = 1) | 0.56**| 0.27  | 1.75 (1.02-3.01) | 0.08 | 0.40  | 1.09 (0.49-2.42) |
| Expenditure × Age (below poverty × age 25-44 = 1) | -1.48**| 0.66  | 0.22 (0.06-0.83) | 0.58 | 0.38  | 1.78 (0.84-3.80) |

*P < .01, ** P < .05, *** P < .001
15-24 years old, while in rural areas, the labor force had worsen condition with higher chance of having the very sick health status. Again, Labor force who aged 45+ are more likely to have the sick and the very sick health status in both urban and rural areas. Furthermore, married labor force had more likely to have the very sick health status compared to that of never married, the situation was similar to urban areas. Labor force with below high school education was more likely to have the very sick health status compared to that of greater than or equal to high school education, while in rural areas, education rather insignificant factor to the health status. Moreover, employed labor force was more likely to have the very sick health status in both urban and rural areas compared to that of unemployed.

Besides, labor force with 1-3 household members had more chance of having the sick and the very sick health status compared to that of greater than or equal to 4 household members. Next, labor force with greater than or equal to poverty line expenditure per capita had more likely to have the sick health status compared to that of below poverty line expenditure. Labor force who lived in unimproved sanitation condition had higher chance of having the very sick health status in both urban and rural areas, compared to that of improved sanitation. Labor force who lived in broader house areas of greater than or equal to 9m$^2$ had more chance of having the very sick health status compared to that of smaller house areas (below 9m$^2$), but in the rural areas, it rather irrelevant aspect. In addition, labor force who was never married and male also had times higher chance of having the very sick health status, particularly in urban areas. Lastly, solitary to urban areas, labor force who aged 25-44 years old with below poverty line expenditure was less likely to have the very sick health status.

**Discussion**

Labor force as human capital is undoubtedly a weighty factor in productivity which might lead to a progress in economic development. The Population Reference Bureau (2017) in their annual report stated that, a long-term investment in education, health, and skill development can lead to sustainable economic development if reinforced by appropriate government policies. Nevertheless, if the labor force has persistent health complaints, productivity could be undermined. Therefore, the reason behind the increasing number of health complaints must be investigated. Facts regarding the labor force’s individual characteristics and household conditions will hopefully unveil the yet unknown cause. Determinants behind the rising number of health complaints in East Kalimantan province compared to other regions is the subject of this study. Therefore, this study aims to provide initial understanding upon the various factors that contributed to the health status (good, sick, and very sick) of the labor force specifically in East Kalimantan.

In East Kalimantan province, 6 predictors were proven to have significant result on the sick health status: female gender, age 24-44 and 45+, 1-3 number of household members, greater than or equal to poverty line expenditure per capita and improved drinking waters. Whilst, 8 predictors evidenced in influencing the very sick health status: age 45+, married labor force, below high school education, 1-3 household members, unimproved sanitation, greater than or equal to 9m$^2$ house area, and variable interactions of being never married and male.

In the urban areas, there were only 5 predictors that were significant for the sick health status: female gender, age 45+, employed labor force, 1-3 household members, and improved drinking water. Meanwhile, 8 predictors were significant for the very sick health status: age 45+, married, below high school education, 1-3 household members, unimproved sanitation,
greater than or equal to 9m² house area, being never married male and age 45+ who lived above or equal poverty line.

In the rural areas, there were 4 predictors that were significant for the sick health status: age 25-44, age 45+, married, 1-3 household members. Meanwhile, 5 predictors were significant for the very sick health status: age 25-44, age 45+, 1-3 household members, unimproved sanitation, and greater than or equal to 9m² house area.

In East Kalimantan province, and especially urban areas, female labor force was more likely to have poor health status compared to male. A study on the subject of developing countries states that, women typically have a greater burden in family that can affect their health. A married woman is commonly burdened with the demands of having a child, continuous pregnancy and lactation can make a woman malnourished, even more if the woman married at an early age. Furthermore, women’s labor does not decrease if she is pregnant or raising children. Anemia is a disease that is often found in women who are tired in this process and frequently women continue to work even though they are sick or even in the last stages of pregnancy (Santow, 1995). Nevertheless, in the rural areas, gender variable was found to be not significant. A similar finding was also uncovered by Kaori et al. (2006) when he tried to explain the effect of social class inequalities on self-rated health status. One possible explanation for this is the problem of accuracy in self-rated health judgment, as there are tendencies that both man and woman (even though woman are more optimistic about their self-rated health) do not report all their health issues, hence to be rated good health status.

Evidently, in East Kalimantan province, people with older age groups had more tendency to have poor health status. This result is in line with previous finding which stated that the older a person is, the more their health status deteriorates (Cai et al, 2006). This could possibly due to the low health literacy in the older personnel, even though the ability to seek, fathom and utilize health information is essential to improve one’s health-related behaviors and lessen risky habits (Liu et al. 2015). The labor force who was never married is more likely to have a very sick and sick health status compared to those whom married. Although the result is contradicting with this research hypothesis, some studies have showed similar findings. Trouble in marriage and certain stressful life events can enhance the risk of psychological distress which if prolonged can cause poor health status (Pearlin, 1989).

In the rural areas, although the odds ratio is in line with the hypothesis, education was not significant for both very sick and sick health status. Despite that many studies had suggested that the level of education affects one’s health, one of socio-economics studies carried out by Smith et al. (1998) argues that, education is only an intermediate variable for health and the effects of the level of education on someone’s health show non-significant result. Smith also concludes that education brings people to higher occupational class which lead to higher income, and then eventually increase the chances of having good health.

In urban & rural areas, urban areas, employed labor force was more likely to have poor health status. These results are similar with findings when she studied health behavior in two community samples. The employed men have high smoking and heavy drinking habits due to high work demands. Furthermore, the full-time employed women have less physical activity and but higher stress which eventually increase the amount smoking, both of which increase morbidity and mortality rates. However, in rural areas, though not significant employed labor force was more likely to have the sick health status. Study about meaningfulness of life and health, emotional, behavioral, and social factors in England showed similar result, where employment status was not affecting one’s sense of living a meaningful life which later lead to better health status. But the results become significant if it is related to individual wealth
instead of being either employed or unemployed (Steptoe and Fancourt, 2020).

Labor force with 1-3 family members had higher chance of having a very sick and sick health status. This result, contrary to the hypothesis, is in line with previous research which stated that, people who live alone or only with partners tend to be more susceptible to illness than if they live in a larger family unit (Turagabeci et al. 2007).

Expenditure per capita was significant in urban and rural areas simultaneously, while in urban areas was significant after having interacted with age variable. Nevertheless, expenditure per capita variable was showing counter hypothesis result that is labor force with above poverty line expenditure had poorer health status. Although it is rather inconclusive, one possible explanation is that high spending on tobacco has taken quite large proportion of household expenditure. A large proportion of tobacco expenditure can lessen household spending on food and nutrition, ability to pay debts, and even healthcare expenses, all of which might lead to an increase of individual's risk of getting sick (Wang et al. 2006). Moreover, in rural areas, expenditure per capita was not significant. Expenditure per capita variable mostly consists of household food expenditure per capita. Research conducted by Sari (2016) in the East Kalimantan region observed that, contrary to urban areas, rural inhabitant tends to self-produce their staple goods. Thus, prices become much inexpensive in the rural areas compared to that of the urban areas. Moreover, demand for staple goods in the rural areas is more inelastic meaning that people are less sensitive to price changes making household expenditure per capita less reliable factor for health status.

In urban and rural areas simultaneously and urban areas, labor force who utilized improved drinking water was more likely to have sick or very sick health status. Therefore, labor force who utilizes unimproved drinking water was less likely to have poor health status. This finding is not in line with the research hypothesis, yet the condition maybe differs to developing countries such as Indonesia. A study in Jakarta reveals that, the risk of diseases caused by drinking for instance diarrhea was found to be very low among users of unimproved water such as bottled water and refill water or kiosk (referred to as isi ulang depots in Indonesia) water compared to that of wells. The study found that the use of bottled water and kiosk water is associated with a decreased rate of diarrhea (Sima et al. 2012).

In the rural areas, the estimation result for the drinking variable unexpectedly suggested a counter hypothesis result where drinking water should have an effect on one's health. Notwithstanding, in a detailed reports conducted by the National Research Council, U.S.A show there was no adverse effect on health caused by drinking water. A possible explanation is that the water quality in East Kalimantan rural areas has adequate nutrition and no environmental pollutant exposure at an alarming rate compared to those of countries like Africa and Taiwan.

Labor force who resided with unimproved sanitation were more likely to have poor health status compared to those of who reside in improved sanitation. These results are similar with Mara et al. (2010) study in which stated that, people who live under an unhealthy sanitation are more vulnerable to illnesses such as diarrhea, trachoma, soil-transmitted helminthiases which mainly caused by human feces.

Labor force who lived in broader house area of greater than or equal to 9 m² was more likely to have poor health status. This result contradicts common understanding, one of which is stated by Waters et al. (2001) who contends that poor and overcrowded housing conditions might accelerate airborne diseases transmission. This finding is still open to debate, as for one reason people who live under good housing condition could still have the possibility to become sick if they had history of disease caused by previously lived under overcrowded, bad housing conditions (King, 2003).
In urban areas, labor force aged 25-44 with greater than or equal to poverty line expenditure per capita had more likely to have the very sick health status. While the result seems to contradict the hypothesis, increased income per capita which simultaneously raised labor force’s food expenditure can cause over-nutrition problem which lead to obesity, and increased risk of cardiovascular disease. Boost in calorie consumption, contributing to energy imbalance caused by an upsurge in the amount of unnecessary food spending has a negative impact on the health of the workforce due to increased obesity-diabetes, heart disease, and various forms of cancer even in productive working age population (Huffman et al. 2010).

**Conclusion**

This study is merely a preliminary step to uncover bigger concern regarding the causes of health problems specifically in the labor force. Moreover, the findings of this study might become a complement to global literature by presenting the findings of the East Kalimantan region. However, certainly, there are still many issues that seems to be baffling and require further research. Such as the cause of the higher rate of the very sick category in which people were having disruptions in their activities. Notwithstanding, the government need to pay more attention to the very sick category since it can potentially deter economic acceleration. Although variables such as gender, education, employment, and drinking water are proven to be significant in the urban areas, this was not the case with the rural areas.

According to the odds ratio, age 45+ greatly affects the health status of the East Kalimantan labor force. Therefore, the government should give more attention to the labor force who were probably in their peak performance, providing insurance costs relief while increasing the types of diseases and work accident covered by the national insurance would be a welcomed program. Implementing policies that can ease the burden on labor force of this age group is highly recommended. Likewise, number of household members was proven to be significant in all areas analyzed. Despite the counter hypothesis result, the government could spend more for the labor force with small family size by providing foods stamps, or low cost health benefits especially for those who are also with low income. Furthermore, unsanitary behavior contributes in exacerbating the sanitation system particularly if there is no comprehensive effort from community. The government could help to prevent this conditions by giving information and education about clean living behavior to the people. Since this study using simple cross sectional data together with the limitation in the data itself, robust association between predictors and health status cannot be fully established. Ultimately, despite the limitations, this study suggests that improvement in individual characteristics and household condition could enhance the labor force health status which will lead to an improved productivity.

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