

## Structural Equation Modeling: Community Empowerment on Health Status and Pregnant Women Nutritional Status

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**Abstract:** Health problems about chronic lack of energy, low education, irregular eating patterns and poor health conditions in pregnant women in some villages in Jelbuk sub-district of Jember Regency are still very high. The research design uses confirmatory research and explanatory research. The sample included pregnant women in Sukowiryo village, Jelbuk village, Sugerkidul village, Sukoember village, Sucopangepok village, Panduman village, Jember District is 187 respondents. The research used a cluster random sampling technique. The variables include community empowerment, health status, pregnant women nutritional status. Data analysis using structural equation modeling with parameter data estimation using software analysis of moment structures Version 21. Estimation of empowerment of society to health status with value 0.105, health status to nutritional status of pregnant women with value 0.020, community empowerment of nutritional status of pregnant women with value 3.690, empowerment of society to the nutritional status of the pregnant mother through health status with value 0.002, community empowerment to health status with value 0.105. Community empowerment can be through health education and motivation improvement which is expected to decrease maternal and infant mortality and low birth weight case.

**Key words:** Community empowerment, health status, pregnant women nutritional status, community, health status, empowerment

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### INTRODUCTION

The nutritional status of pregnant women has implications for growth, development and health in offspring (Barker *et al.*, 2018). Growth and development in children and reduced risk of infectious diseases as adults can be achieved through improved maternal nutritional status during pregnancy and health behavior (Godfrey *et al.*, 2010). Health problems of malnutrition such as lack of calorie energy, low education, irregular diet and poor health conditions in pregnant women in some villages in the District Jelbuk, Jember Regency is still very high.

The UN Food and Agriculture Organization (FAO) estimates that 868 million people worldwide suffer from malnutrition (FAO and IFAD., 2012). In Indonesia the size limit of the upper arm circumference of pregnant women with less calorie energy risk of 23.5 cm. Pregnant women with less calorie energy risk cause the baby to be born with low birth weight, so that, the risk of death, malnutrition, growth and developmental disorders. Prevention of less energy-calorie risk in fertile-age mother

before pregnancy by increasing nutritious nutritional intake (Anonymous, 2009) or adequate quantity and food intake (Gomez *et al.*, 2013) that can be identified by size upper arm circumference of not <23.5 cm (Anonymous, 2009) and deficits in quantity and quality refers to total calorie intake and quality for variety, diversity, nutritional content and safety (Gomez *et al.*, 2013). If the size of the circumference of the mother's upper arm before pregnancy is <23.5 cm, then the mother should delay pregnancy first because it will risk giving birth to babies with low birth weight. The results of the Saraswati (1998) study showed that pregnant women with less caloric energy in the upper arm circumference of 23.5 cm were not at risk of having low birth weight babies. Pregnant women with less caloric energy in the upper arm circumference of 23 cm at risk 2.0087 times gave birth to infants with low birth weight compared with mothers who have an upper arm circumference of more than 23 cm.

In District Jelbuk, Jember Regency about the problem of calorie energy is still high. In 2015 there were 48 pregnant women with less calorie energy spreadin 6 villages namely Jelbuk village, Panduman village,

Sukowiryo village, Sucopangepok village, Sukojember village and Sugerkidul village. The data of public health center Jelbuk October 2015 there are as many as 40 pregnant women with less calorie energy that has been handled but there are still 4 cases of infants with low birth weight.

Factors that affect health status in pregnant women is nutrition. Several risk factors that affect the nutritional status of pregnant women include low economic level, low education, unhealthy environment, irregular diet, poor health conditions and inadequate food intake (Gomez *et al.*, 2013). Impact of nutritional status of pregnant women will adversely affect nutritional status, growth and development of the fetus.

Some ways to find out the nutritional status of pregnant women include monitoring weight gain during pregnancy, measuring upper arm circumference, measuring hemoglobin (Anonymous, 2009) and increasing protein energy (Pinstrup-Andersen, 2012). Maternal weight gain during pregnancy around 10-12 kg consists of trimester 1 weight gain <1 kg, trimester 2 weight gain about 3 kg and trimester 3 weight gain about 6 kg. Weight gain in each trimester is an indicator to monitor fetal growth. Measurement of upper arm circumference aims to know someone experiencing the problem of less calorie energy (Anonymous, 2009).

The solution to solve the problem of less calorie energy in pregnant women is by empowering the community through public health service program. Community health service programs can reduce maternal and infant mortality and low birth weight. Implementation of community organizing, mobilization and empowerment involves community leaders, religious leaders and health cadres directly with families and pregnant women. The implementation aims to maintain a good pregnancy in the process of safe and healthy childbirth.

**MATERIALS AND METHODS**

The study design uses confirmatory research and explanatory research. The study aims to analyze the estimated effect (direct effect), estimated indirect influence (indirect effect) and the estimated total effect (total effect) between variables. Estimate the direct effects of: community empowerment ( $X_1$ ) on health status ( $Y_1$ ), health status ( $Y_1$ ) on nutritional status of pregnant women ( $Y_2$ ), community empowerment ( $X_1$ ) on nutritional status of pregnant women ( $Y_2$ ). Estimation of the indirect effect of: community empowerment ( $X_1$ ) to the nutritional status of pregnant mother ( $Y_2$ ) through health status ( $Y_1$ ). Estimates of total effect include: the sum of all direct effects of: community empowerment ( $X_1$ ) to health status ( $Y_1$ ) and indirect influence of: community empowerment ( $X_1$ ) to health status ( $Y_1$ ).

The research used a sampling technique cluster random sampling. The sample included pregnant women in Sukowiryo village, Jelbuk village, Sugerkidul village, Sukojember village, Sucopangepok village, Panduman village, Jelbuk District, Jember District. The sample size is 187 respondents. The research instrument used Likert scale questionnaire, upper arm circumference meter, TT immunization card, Fe tablet card and tensimeter.

Variables of community empowerment ( $X_1$ ) include knowledge level ( $X_{1,1}$ ), attitude ( $X_{1,2}$ ), motivation ( $X_{1,3}$ ). The health status variables ( $Y_1$ ) included: pre-pregnancy level ( $Y_{1,1}$ ), post-pregnancy knowledge level ( $Y_{1,2}$ ), prior nutritional status ( $Y_{1,3}$ ), nutritional status after ( $Y_{1,4}$ ). Maternal nutritional status variables ( $Y_2$ ) include non-chronic upper arm circumference ( $Y_{2,1}$ ), gestational age ( $Y_{2,2}$ ), TT immunization ( $Y_{2,3}$ ), Fe tablet ( $Y_{2,4}$ ), high fundus uteri ( $Y_{2,5}$ ), blood pressure ( $Y_{2,6}$ ). Each of the variables and indicators is shown in Fig. 1.

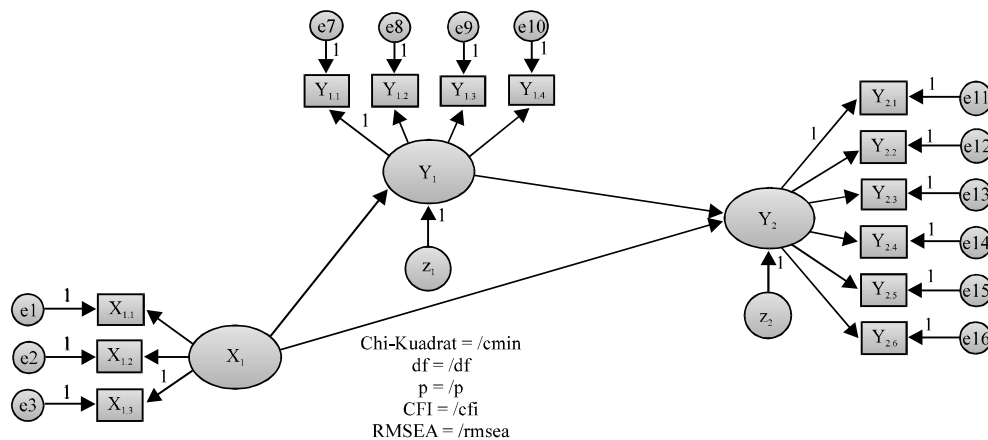


Fig. 1: Hypothesis model: community empowerment to health status and pregnant women nutritional status

Data collection techniques by filling out the questionnaire format of knowledge level, attitude, motivation, pregnancy knowledge level, nutritional knowledge level, filling the TT immunization data format, Fe tablets and measure the circumference of the upper arm, measure the height of the fundus uteri, measure the blood pressure.

Data analysis using Structural Equation Modeling (SEM) with parameter data estimation using software Analysis of Moment Structures (AMOS) (Byrne, 2013). SEM functions to assess the latent variables at the observation level (Bagozzi and Yi, 2012). The SEM test simultaneously tested the model (Kline, 2015) which estimates the effect between community empowerment on the health status and nutritional status of pregnant women.

**RESULTS AND DISCUSSION**

**Estimation of direct effect:** Based on Table 1, that the value of 0.105 is the estimation of the effect (loading structural) of community empowerment ( $X_1$ ) on health status ( $Y_1$ ). This value means that if the level of community empowerment ( $X_1$ ) rises one unit, then the health status level ( $Y_1$ ) will rise by 0.105 units.

The value of 0.020 is an estimate of the unstandardized (loading structural) effect of health status ( $Y_1$ ) on the nutritional status of pregnant women ( $Y_2$ ). This value means that if the health status level ( $Y_1$ ) rises one unit, then the nutritional status of pregnant women ( $Y_2$ ) will increase by 0.020 units.

The value of 3.690 is an estimate of the non-standardized impact of loading (loading structural) of community empowerment ( $X_1$ ) on the nutritional status of pregnant women ( $Y_2$ ). This value means that if the level of community empowerment ( $X_1$ ) rises one unit, then the nutritional status of pregnant women ( $Y_2$ ) will increase by 3.690 units.

**Estimation of indirect effect:** Based on Table 2 that, estimate indirect individual effect from community empowerment ( $X_1$ ) to nutritional status of pregnant mother ( $Y_2$ ) through health status ( $Y_1$ ) are:  $0.105 * 0.020 = 0.002$ . This means the level of nutritional status of pregnant women ( $Y_2$ ) will increase by 0.000 units per increase of community empowerment ( $X_1$ ) by 1 unit after through mediation on health status ( $Y_1$ ). So, the total coefficient indirect effect of community empowerment ( $X_1$ ) on the nutritional status of pregnant mother ( $Y_2$ ) is equal to 0.002 (Fig. 2 and 3).

**Estimation of total effect:** In Table 3, it was found that the estimated direct effect of community empowerment ( $X_1$ )

Table 1: Direct effect

Estimate	Values
$Y_1 <--- X_1$	0.105
$Y_2 <--- Y_1$	0.020
$Y_2 <--- X_1$	3.690

Table 2: Indirect effect

Estimate	Values
$Y_1 <--- X_1$	0.105
$Y_2 <--- Y_1$	0.020
$Y_2 <--- X_1$	3.690

Table 3: Direct effect

Estimate	Values
$Y_1 <--- X_1$	0.105
$Y_2 <--- Y_1$	0.020
$Y_2 <--- X_1$	3.690

Table 4: Total indirect effect

Estimate	$X_2$	$X_1$	$Y_1$	$Y_2$
$Y_1$	0.000	0.000	0.000	0.000
$Y_2$	0.002	0.000	0.000	0.000

The estimation of total effect to  $x_1 \rightarrow y_1$

on health status ( $Y_1$ ) = 0.105. In Table 4 it was found that the total estimated indirect effect of community empowerment ( $X_1$ ) on health status ( $Y_1$ ) = 0.000. Thus: estimate the effect of total community empowerment ( $X_1$ ) on health status ( $Y_1$ ) =  $0.105 + 0.000 = 0.105$ . These results can be interpreted that the health status ( $Y_1$ ) will rise by 0.224 units for each increase in community empowerment ( $X_1$ ) by 1 unit after passing all the paths between the two variables.

**Estimation of direct effect**

**Community empowerment to health status:** The value of 0.105 is the estimation of the unstandardized impact of (loading structural) from community empowerment ( $X_1$ ) on health status ( $Y_1$ ). This value means that if the level of community empowerment ( $X_1$ ) rises one unit, then the health status level ( $Y_1$ ) will rise by 0.105 units.

Variables of community empowerment include the level of knowledge, attitude and motivation. The result of research on the level of knowledge of pregnant women about the quality of life associated with health status is a multidimensional concept (Wilson and Clearly, 1995). The level of knowledge of pregnant women about the quality of life relates to health status refers to individual perceptions of well-being and role in physical and mental (Ware *et al.*, 1995). The attitude of pregnant women is related to the motivation of mothers who turn to more sophisticated information technology tools such as the internet to obtain information and support about the level of health knowledge (Stockdale *et al.*, 2007). The concept varies according to cultural effect (Olmedo-Alguacil *et al.*, 2015). The level of knowledge of pregnant women about the quality of life associated with different health status for individuals with different cultural or ethnic backgrounds (Kagawa-Singer *et al.*, 2010).

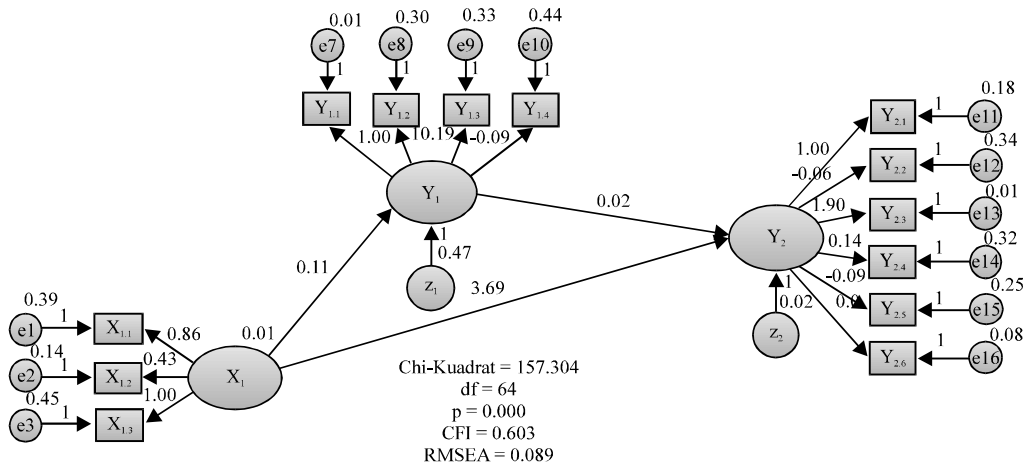


Fig. 2: Structural equation modeling: community empowerment to health status and pregnant women nutritional status



Fig. 3: The indirect effect equation

Pregnancy is a unique thing in a mother’s life, so, striking physiologically, metabolically, socially and psychologically changes that can change the ability of pregnant women to perform traditional roles and improve the quality of health status associated with maternal life (Arizabaleta *et al.*, 2010). The physiological effects of pregnancy decreased and resulted in sleep disturbances thus, affecting the physical and mental state associated with maternal knowledge levels about the quality of life during pregnancy and in non-obese pregnant women (Tsai *et al.*, 2016). This suggests that the maternal knowledge level of quality of life is related to health status. The results of the study in Mexico reported that the physical and mental component score was significantly lower in obese pregnant women than in non-obese pregnant women (Amador-Licon and Guizar-Mendoza, 2012; Amador *et al.*, 2008). Additional feeding variables include weight and height. Pregnant women of normal weight with higher education levels have higher levels of nutritional knowledge and positive breastfeeding preparation attitudes (Lau *et al.*, 2017). The level of knowledge of pregnant women about the quality of health associated with women’s lives in terms of self-confidence and motivation of breastfeeding (Zubaran and Foresti, 2011).

**Health status to pregnant women nutritional status:** The value of 0.020 is an estimate of the unstandardized (loading structural) effect of health status ( $Y_1$ ) on the

nutritional status of pregnant women ( $Y_2$ ). This value means that if the health status level ( $Y_1$ ) rises one unit, then the nutritional status of pregnant women ( $Y_2$ ) will increase by 0.020 units.

Variables of health status include the level of knowledge of pregnancy and the level of nutritional knowledge. The results of a study of maternal knowledge levels of pregnancy on body weight during pregnancy that the prevalence of overweight or obesity around the world is 39 and 13%, respectively are women of reproductive age (WHO., 2016). The results of the study in Singapore that the prevalence of overweight or obesity pre-pregnancy is 25%. This figure is lower than the proportion of overweight or obese pregnant women aged 18-69 years (Anonymous, 2010). The results showed that knowledge of breastfeeding preparation was influenced by maternal obesity (Turcksin *et al.*, 2014).

The problem of body weight due to different age and race composition factors. The results of research in Singapore that overweight or obesity rates increased by about 1% per year, especially in Malay and Indian races (Anonymous, 2010). It is related to the comfort factor of eating outdoors. As many as 60% of Singaporeans regularly eat in public places such as hawker centers, food courts and coffee shops and Singaporeans consume excessive calories and fats (HPB., 2010). The results suggest that dietary intake contains more saturated fats and highly nutritious foods in Malay and Indian race foods (Neelakantan *et al.*, 2016). Other research finds that women alter the physical activity and dietary patterns during pregnancy (Chen *et al.*, 2014; Padmapriya *et al.*, 2015). Pregnant women in Singapore refuse physical activity and increase sitting time and viewing television (Padmapriya *et al.*, 2015) and consuming milk, fruit,

vegetables, rice, noodles and bread (Chen *et al.*, 2014). Pregnant women of the Malay and Indian races more often increase sitting time during pregnancy compared to Chinese race in Singapore. Lifestyle changes, especially, pregnant women's knowledge of nutrition can increase the number of overweight or obese pregnant women in Singapore (Padmapriya *et al.*, 2015). Mother's overweight or obesity affects the initiation and duration of breastfeeding but relatively little affects the mother's attitude in the preparation of breastfeeding (Amir and Donath, 2007; Turcksin *et al.*, 2014). The results of the study show that pregnant women are less likely to be obese during breast-feed preparation than non-obese women (Guelinckx *et al.*, 2012). Other results found that obese pregnant weight mothers were no different from non-obese pregnant women in motivation for breastfeeding preparation (Hauff *et al.*, 2014).

**Community empowerment to pregnant women nutritional status:** The value of 3.690 is the estimation of the non-standardized impact of loading (loading structural) from community empowerment ( $X_1$ ) on the nutritional status of pregnant women ( $Y_2$ ). This value means that if the level of community empowerment ( $X_1$ ) rises one unit, then the nutritional status of pregnant women ( $Y_2$ ) will increase by 3.690 units.

Variables of community empowerment include the level of knowledge, attitude and motivation. The attitude of pregnant women is very important in optimizing fetal health and well-being as it is beneficial in the short and long-term to mother, child, family and society (Victoria *et al.*, 2016; Lau *et al.*, 2017). Fulfillment of nutritional needs is very important especially related to changes in the mother's body and fetal development (Anonymous, 2009). This is one of the factors associated with the behavior of breastfeeding (Linares *et al.*, 2015). The attitude of pregnant women is a predictor factor of exclusive breastfeeding initiation (Cox *et al.*, 2015; Linares *et al.*, 2015; Wang *et al.*, 2014). It is also present in the antenatal period and is influenced by multidimensional factors (Roll and Cheater, 2016). The results of the study reported that factors affecting maternal attitude in breastfeeding include maternal characteristics, including age (Nouer *et al.*, 2015), ethnicity (Linares *et al.*, 2015), education level, occupational status (Ishak *et al.*, 2014), household income (Persad and Mensinger, 2008), parity, pregnancy intentions (Kost and Lindberg, 2015), caregivers (Filca *et al.*, 2016) and previous exclusive breastfeeding experience (Mitra *et al.*, 2004).

#### **Estimation of indirect effect**

**Community empowerment to nutritional status of pregnant women through health status:** Estimation of the individual indirect influence of community empowerment ( $X_1$ ) to the nutritional status of pregnant mother ( $Y_2$ ) through health status ( $Y_1$ ) is  $0.105 * 0.020 = 0.002$ . This means that the level of nutritional status of pregnant women ( $Y_2$ ) will increase by 0.000 units per increase of community empowerment ( $X_1$ ) by 1 unit after through mediation on health status ( $Y_1$ ). So, the total coefficient indirect effect of community empowerment ( $X_1$ ) on the nutritional status of pregnant mother ( $Y_2$ ) is equal to 0.002.

During pregnancy, pregnant women should prepare to welcome the birth of a baby by increasing knowledge about pregnancy and complete nutrition. A healthy mother will give birth to a healthy baby. Maternal nutrition during pregnancy is one of the determining factors that affect the baby's birth normally. During pregnancy, there is an increased need for nutrients, such as carbohydrates, proteins, vitamins and minerals (Hasugian, 2012).

According to the nutritional adequacy rate of 2004 that a pregnant mother is encouraged to consume the following additional energy and protein: 1 trimester of 100 calories and 17 g of protein, 2 trimesters of 300 calories and 17 g of protein, 3 trimesters of 300 calories and 17 g of protein by expectations can be met in 3 consecutive trimesters. The need for vitamins and minerals in all three trimesters also increases. Pregnant women need additional vitamin A 300 RE, thiamin 0.3 mg, riboflavin 0.3 mg, Niacin 0.3 mg, 200 mcg folic acid, pyridoxine 0.4 mg, vitamin B 0.2 mcg, vitamin C 10 mg, Calcium 150 mg, magnesium 30 mg, iodine 50 mcg, Selenium 5 mcg, manganese 0.2 mg and fluoride 0.2 mg. As for the additional iron requirement in pregnant women vary in the first trimester does not require additional in trimester 2 as much as 9 mg and in trimester 3 as much as 13 mg. Additional need for Zinc (Zn) minerals in trimester 1 of 1.7 mg in trimester 2 as much as 4.2 mg and in trimester 3 as much as 9 mg (Anonymous, 2009).

#### **Estimation of total effect:**

**Community empowerment to health status:** In Table 3 it was found that the estimated direct influence of community empowerment ( $X_1$ ) on health status ( $Y_1$ ) = 0.105. In Table 4 it was found that the total estimated indirect effect of community empowerment ( $X_1$ ) on health status ( $Y_1$ ) = 0.000. Thus, estimate the effect of total community empowerment ( $X_1$ ) on health status ( $Y_1$ ) =  $0.105 + 0.000 = 0.105$ . These results can be interpreted that

the health status ( $Y_1$ ) will rise by 0.105 units for each increase in community empowerment ( $X_1$ ) by 1 unit after passing all the paths between the two variables.

Variables of community empowerment include the level of knowledge, attitude and motivation. Negative perceptions of pregnant women on health status during pregnancy can lead to a decrease in the quality of life associated with health status (Kolu *et al.*, 2014).

Respecting cultural differences in understanding the quality of life-related to health status is important because the dimensions and sources of social and support religious may differ between cultures (Kagawa-Singer *et al.*, 2010). Research results in the United States show that Asians have a quality of life associated with better health status than whites and other ethnic groups (Chowdhury *et al.*, 2008; Zahran *et al.*, 2005, Mallongi *et al.*, 2018).

Intellectual factor factors influence pregnant women in making decisions for breastfeeding preparation (Chin *et al.*, 2008) and pregnant women with high levels of education have more accurate breastfeeding knowledge than low levels of education (Zhou *et al.*, 2010). This study is consistent with studies showing a positive relationship between knowledge of infant feeding and maternal decision making in the choice of infant feeding (Radzimirski and Callister, 2016; Roll and Cheater, 2016). Pregnant women of normal weight with a level of a high education have high pregnancy knowledge and positive breastfeeding attitudes (Ishak *et al.*, 2014; Nouer *et al.*, 2015, Nur *et al.*, 2019).

The results show that pregnant women who have a good health status in a happy life have important health. Pregnant women are more considering breastfeeding as an important part because of the many benefits of breastfeeding on health and are willing to participate in healthy breastfeeding behavior (Bakas *et al.*, 2012). Pregnant women with a quality of life associated with better health status have a positive attitude towards breastfeeding. In contrast, quality characteristics of health status associated with poor living such as poverty, fatigue, energy loss, depression, anxiety, labor difficulties (Ware *et al.*, 1995). This illustrates inadequate pregnant women of the quality associated with the poor health status of life for assistance and use of antenatal care services (Nisar *et al.*, 2016). The results of previous studies suggest that pregnant women with few antenatal visits have a quality of life associated with low health status (De Oliveira *et al.*, 2015). During an antenatal visit, attendance of healthcare support is crucial in the selection of baby food (Meedyia *et al.*, 2010). The results of research in Hong Kong show that pregnant women with low knowledge about antenatal will have poor

breastfeeding attitudes (Lau *et al.*, 2017) because pregnant women have decided to breastfeed during early pregnancy (Brand *et al.*, 2011).

## CONCLUSION

In the estimation of direct effect that, empowerment of society to health status with value 0.105, health status to nutritional status of pregnant women with value 0.020, community empowerment of nutritional status of pregnant women with value 3.690. In the estimation of the indirect effect that empowerment of society to the nutritional status of the pregnant mother through health status with value 0.002. In the estimation of the total effect that community empowerment to health status with value 0.105.

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