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Maternal Mortality with Panel Regression Approach Model based on Maternal and Child Health Revolution Program or ETC Performance Indicators at Nusa Tenggara Timur Province Indonesia

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ABSTRACT

Nusa Tenggara Timur (NTT) government had launched a local specific program, namely Maternal and Child Health Revolution Program (MCHRP) or *Revolusi KIA* at 2009. However, maternal mortality still becomes one of the biggest public health problems in NTT Province in Indonesia.

The slow decreasing of Maternal Mortality Ratio (MMR) need a study in order to determine MCHRP performance indicators that have the biggest influence in decreasing maternal mortality ratio at each district of NTT Province at a specific range of time in order to develop a more effective, efficient and directed plan or policy for maternal and child health intervention program.

The aim of this research is to identify and analysis factors that influence the maternal mortality ratio of 2011 – 2015 based on MCHRP performance indicators at every district and municipality of NTT Province.

This applied research used data from MCHRP indicators program reports from 2011 to 2015 at Public Health Division of NTT Health Office with 22 districts and municipalities as unit analysis. The data analyzed using panel data regression.

Result from this analysis shows that the trend of performance indicator achievements tends to fluctuate and imbalanced for every district and municipality. The best Panel Data Regression Model that can be used for evaluating the achievement of MCHRP performance indicators toward MMR at NTT is the Random Effect Model that takes into account the place and time effect error. Indicators that have significantly influenced in decreasing MMR at NTT are the complete Ante Natal Care (ANC) visit, childbirth assisted by a skilled health professional with midwifery competence, complete postpartum care (PNC) visit and complication care with determination coefficient (R^2) 90%.

Keywords: *Maternal Mortality Ratio (MMR), Maternal and Child Health Revolution Program, Panel Data Regression*

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INTRODUCTION

Indonesia is one of developing countries that did not reach MDG's target in decreasing MMR to 102/100,000 live birth in 2015[(1)] Based on data from Demographic and Health Survey (DHS) there was a significant increasing of MMR in Indonesia from 228/100,000 live births in

2007 to 359/100,000 live births in 2012. Furthermore, based on Beetwen Sensus Population Survey in 2015 the MMR in Indonesia is 305/100,000 live births, which is still far from the MDG's target.

Since 2009, NTT as one of the provinces in Indonesia that has a highest MMR has been trying to accelerate the decreasing of maternal and child morbidities and mortalities with a tremendous program called Maternal and Child Health Revolution Program (MCHRP) or *Revolusi KIA*.

This program runs through a regulation that all childbirth must be assisted by skilled health professional with midwifery competence at adequate health care facility for 24 hours[3]. This regulation has an impact on the increased numbers of health care facilities and health care facilities with basic obstetric and neonatal emergency care at NTT from 292 sub district health center or *puskesmas* with 61 *puskesmas* equipped by basic obstetric and neonatal emergency care (20.89%) in 2009 to 374 *puskesmas* with 374 *puskesmas* equipped by basic obstetric and neonatal emergency care (62.57%).

However, this MCHRP seems to be not yet effective in reducing the MMR at NTT. The annual reduction of MMR tends to slowly decrease which is 220/100,000 live birth in 2011, 200/100,000 live birth in 2012, 185,6/100,000 live birth in 2013, 169/100,000 live birth in 2014 and 133/100,000 live birth in 2015.The low achievements of MCHRP performance indicators which are complete ANC visit coverage is 61.63%, childbirth assisted by skilled health professional with midwifery competence coverage is 69.97% and childbirth at health care facilities coverage is 69.95%[4]. These facts showed that there are still 34% childbirth delivered at home and around 30% childbirth still assisted by traditional birth attendance that put the maternal at risk. When obstetric complication on childbirth happened it can be lead to maternal and child dead if handling late that can be caused by late referee caused by geographic, social cultural or economic factors[5][6].

There are some challenges and obstacles in the process of reducing MMR at NTT such as the insufficient knowledge and awareness from the community toward the importance of maintaining health and safety of pregnant women; insufficient nutrition status and health of pregnant women; limited access of pregnant women to qualified health care facilities and comprehensive obstetric care caused by geographic and topographic factors (archipelago, highland and hill) and the patriarchy culture; insufficient numbers of health care facilities and insufficient of health professionals (quantity, quality and distribution)[7][8].

Thus to make the initiatives in reducing MMR program at NTT succeed, it is important to define the achievement indicators of MCHRP that have the biggest effect in reducing MMR at every district and municipality at NTT at a specific period of time in order to develop a more effective, efficient and directed plan or policy for maternal and child health intervention program.

The aim of this research is to identify and analysis factors that influence the maternal mortality ratio of 2011 – 2015 based on performance indicators of MCHRP at each district and municipality of NTT Province.

MATERIAL AND METHOD

This applied research used data from MCHRP indicators program reports from 2011 to 2015 at Public Health Division of NTT Health Office with 22 districts and municipalities as unit analysis. The data analyzed using panel data regression because it takes into account the weighting of individual effect (district/municipality) and time period (2011 – 2015).

Analyzed variables in this research are the response variables, i.e. MMR, predictor variables, i.e. ANC 1st coverage, 4 times ANC coverage, childbirth assisted by skilled health professionals with midwifery competent coverage, 3 times PNC visits, complication care coverage and the number of puskesmas equipped by basic obstetric neonatal emergency care at every district and municipality.

Panel Regression Model analyzed by eviews7 software consists of three models which are the common effect model, the fixed effect model and the random effect model.

The best regression model was selected by using Chow test and Hausman test. Chow test is used to choose between the common effect model and the fixed effect model. If the null hypothesis accepted, then the common effect model chose, whereas Hausman test used to choose between the fixed effect model and the random effect model. If the null hypothesis accepted, then random effect model chose. The best regression

model will use to estimate the panel data.

FINDINGS

Table 1 shows that MMR average and the achievements of MCHRP performance indicators tends to fluctuate and imbalance at every district and municipality in NTT Province, which are shown from standard deviation and the big difference of minimum and maximum at every research variable. MMR average from 2011 to 2015 is 181.5/100.000 live birth.

There is a significant difference between every district and municipality with range between 107.40/100.000 live births to 219.8/100.000 live birth. PNC visit indicator and complication care indicator coverage also showed a big significant difference between every district and municipality in the 5 years time period.

Table 1: Description of research variables of NTT Province 2011 – 2015

Indicator/Research Variables	Mean	SD	Min	Max
MMR	181.50	32.96	107.40	219.8
ANC (1th visit) coverage	86,00	11.82	38.9	127.5
Complete ANC (minimum 4 times visit) coverage	61.80	14.41	30.7	92.1
Skilled health professional with midwifery competence birth delivery assisted coverage	74.00	5.30	69.10	76.60
PNC (minimum 3 times visit)	77.10	18.4	11.3	102.6
Complication care coverage	52.00	26.00	6.9	117.4
Puskesmas equipped by obstetric and neonatal emergency care coverage at every district/municipality	5.00	3.00	2.00	16.00

The data panel regression analysis benefit to look for MMR difference at every district and municipality in the time period. Every indicator very depended by the difference of time (year) and place (district/ municipality).

The test result of the best panel data regression can be seen in table 2. The result from Chow test shown p value = 0.000 meaning that the common effect model rejected. Whereas the result from Hausman test show p value = 0.138 meaning that the random effect model accepted that can be used further to estimate performance indicator of MCHRP toward MMR at every district and municipality NTT in 2011 – 2015 time period. Random effect model resulting from the analysis for MMR estimation at NTT province has taken into account the heterogeneity of unobservable place and time variables and reduce the colinearity between predictor that resulted a more efficient estimation[9]

Table 2: The best panel regression model test result

Test	Statistic value	*p*-value
Chow Test	F = 5.1631	0.000
Hausman Test	X^2 = 2199	0.138

Based on the result on table 3 performance indicators of MCHRP that significantly influence the MMR in NTT are ANC visit, childbirth assisted by skilled health professionals with midwifery competence, PNC visit and complication care. The indicator that has the biggest influence in reducing MMR in NTT Province is the complete ANC visit.

Every regression coefficient in the Random Effect Model that has negative value means that if we increase the four indicators mention above then the MMR will decrease, vice versa.

The R^2 *adjusted* values of this model is 0.9008 which is included in the very good category that mean about 90.08% change in MMR can be explained by these four predictor variables in the model.

Regression coefficient of the complete ANC visit i.e. -0.4814 mean that if the complete ANC visit increase 10%, then the MMR will have a chance to decrease at about of 4/100,000 live births annually both for the district and municipal level estimation and province level estimation. The interpretation of coefficient regression of other variables in the model can be done similarly.

Table 3 Results from Random Effect Model Analyze

Specifications of the indicators				
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**P value**
Constanta (C)	6.6354	2.2724	2.9199	0.0043
Complete ANC (minimum 4 times visits) coverage	-0.4814	0.1808	-2.6626	0.0205
Childbirth delivery assisted by a skilled health professional coverage	-0.0952	0.0436	-2.2319	0.0267
PNC (minimum 3 times visits) coverage	-0.0950	0.0418	-2.3167	0.0258
Complication care coverage	-0.0942	0.0367	-2.4810	0.0238
The best model specification				
R^2	0.9276	F statistic	123.6292	
R^2*Adjusted*	0.9008	p value	0.0000	

DISCUSSION

The result of this research shows that the MCHRP performance indicator that has the biggest contribution in decreasing MMR at every district and municipality in NTT on 2011 – 2015 time period is the complete ANC visit or a minimum 4 times ANC visits indicator. Increasing 10% complete ANC visit coverage will have a chance to decrease MMR in the amount of 4/100.000 live birth.

Hence this indicator needs to get more attention in order to prevent complication and maternal and child mortality. ANC visit related with maternal behavior in health caring and access to health care facilities [(10)].

In the reality, many community members at NTT still consider that the pregnancy is a usual and natural stage of life that lead pregnant women not regularly visit health professional.

These beliefs have an implication of the high numbers of un-detection of maternal with high risk factors. These un-threaten maternal high risk factors lead to the delay on getting care that can cause a serious health consequences such as hospitalization or even death both for the mother or the baby[(11)]. Even though around 80% of maternal mortality are preventable if they regularly visit health professional for ANC. ANC visits is important in order to early detection and on time care for threaten the complication at pregnancy, labor and post partum which can help in reducing MMR [(12).]

This research also found that the average of ANC visit at NTT Province at 2001 – 2015 period was 61.80%.

The utility of the ANC at health facilities influenced by the low of women's autonomy in economic (freedom to regulate their family budget allocation), low freedom on mobility and low authority in decision making which can be caused by maternal status in their family and community. The other factors that can influence ANC visits are the attitude of pregnant women themselves of the importance of their health care especially antenatal care. Supports from family members and community leaders and also information and assistance from heath professionals toward ANC visits can increase maternal intention[(13)(14)]. Therefore, in order to increase the ANC visits coverage at NTT as the most influenced factor in reducing MMR, factors that need more attention are women's autonomy.

The Prenatal class or *Kelas Ibu Hamil* can become a medium for increasing women's autonomy with target and material modification. The Prenatal class that used to target the pregnant women can also make the husband and childbearing age couples as target to prepare them for their pregnancies later. The materials that can be added in the Prenatal class, such as the rule of women in fulfill the reproduction's health right and the need for

reproductive health at every cycle. Hopefully with the increasing knowledge of the pregnant mother and the husband about the reproduction's health will benefit from increasing the complete ANC visit coverage, childbirth assisted by skilled health professionals with midwifery competence coverage and PNC visit coverage.

Besides that, the network that already exists between health professionals with the traditional birth attendance must be more developed in order to make a safe pregnancy, clean and safe childbirth and postpartum by reducing negative myths regarding pregnancy, childbirth and postpartum but still keep culture values that exist in the community in order to reduce MMR and Child Mortality Ratio. This is also important because many pregnant women still choose the traditional birth attendant assist in childbirth, reasoned by their personal reasons such as more familiar, understand and can help with traditional childbirth ritual and also because the traditional birth attendant can assist the maternal and the child up to 40 days after delivery.

CONCLUSIONS

In order to decrease MMR at NTT through the MCHRP, the performance indicators that have the biggest influence are increase the complete ANC visit coverage, the complete PNC visit coverage and childbirth assisted by skilled health professionals with midwifery competence coverage and PNC care visit coverage, respectively, which can increase by target and material modification in Prenatal Class and also by strengthening the network between health professional and traditional birth attendance.

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Ethical Clearance: There are no human participants involved in this research. However the procedure of this research had already gotten ethical approval of Health Research Ethics Committee, Faculty of Public Health Airlangga University.

Informed Consent: This research used secondary data. No informed consent needed.

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