

# Analysis of Maternal Deaths Trends in Bojonegoro, Indonesia

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## ABSTRACT

Maternal Mortality Rate (MMR) could indicate the welfare of a nation. In ASEAN, Indonesia ranks as the highest number of MMR. Furthermore, in Bojonegoro Regency, the MMR ranked 4th in East Java Province after Surabaya, Jember, and Sidoarjo. Indirect causes of maternal deaths consisted of three delays: 1) maternal referral delay; 2) delay in recognizing problems and making decisions; and 3) delay in reaching health facilities and getting services. These three delays are the leading causes of the increase in maternal mortality in Bojonegoro Regency. This study aims to analyze the trends in the number of maternal deaths and predict the occurrence of death in the following year. The data consist of maternal mortality cases for the period 2008-2017, and it analyzed by four trend analysis and compared by the MAPE, MAD, and MSD values for each method. The results show that the two categories use the Quadratic Trend Model precisely. Forecasting results in 2018 are estimated to have decreased maternal mortality by 11.76% from 2017, and in 2019 it is estimated to increase by 33.33%. These results indicate that maternal mortality in Bojonegoro still needs to be anticipated.

**Keywords:** Bojonegoro, maternal mortality, three delays, tren analysis

## Introduction

One statistical tool that can be used to estimate a future event based on past data is the trend. The trend consists of a variable in the periodic series (hours, daily, annual, annual) and tends to go in one direction, namely rising horizontally and decreasing<sup>1</sup>. Forecasting is a connection of trend lines over time from the last observation to the time for forecasting made. Several methods can be used to create trends, namely linear trend methods, quadratic trends, and exponential trends<sup>2</sup>. A linear trend is a trend that increases and decreases in value can be predicted up or down linearly. A quadratic trend is a trend in which the value of an independent variable rises or falls linearly, or a parabola occurs when the data is made scatter diagram. The exponential trend is a trend where the value of the dependent variable increases in multiples.

Arsyad<sup>3</sup> states that the quantification of forecasting errors required to choose the right forecasting techniques. Some measures of accuracy for selecting forecasting methods use Mean Absolute Deviation (MAD), Mean Square Deviation (MSD), and Mean Absolute Percentage Error (MAPE). The smaller the error values, the more accurate the method (MAPE). The data used in this study are secondary data sourced from the Maternal Perinatal Audit (AMP) report, Bojonegoro District Health Office. The description of the welfare of the Indonesian people can be seen from the indicators of Maternal Mortality Rate (MMR)<sup>4</sup>. In Indonesia, the maternal mortality rate is highest compared to other ASEAN countries<sup>5</sup>. In 2015 the Maternal Mortality Rate decreased compared to 2012 as many as 305 per 100,000 live births of the Intercensal Population Survey<sup>6</sup>. However, it is not significant compared to the Millennium Development Goals (MDGs) target; the maternal mortality rate must be reduced by 102,000 per live birth<sup>7</sup>.

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Efforts to reduce maternal mortality are the third indicator of the program (Sustainable Development Goals (SDGs). 2016 is the first year of implementation of the 2015 MDGs development agenda (SDGs). The target set by SDGs reaches a global reduction in MMR of 70

per 100,000 live births by 2030, but this situation is not easy to do where it requires cooperation in various parties with related sectors<sup>6</sup>. The Bojonegoro Regency Maternal Mortality Rate is ranked 4th out of all East Java Provinces after Surabaya, Jember and Sidoarjo<sup>8</sup> can be seen in

Figure 1. The Maternal Mortality Rate in Bonegoro has increased in the past two years but still tends to decline below the MDG target<sup>9</sup> will decline if compared to the 2015 MDGs target of 102/100,000 KH (live birth) and SDGs year 2016 which is 40/100,000 KH.

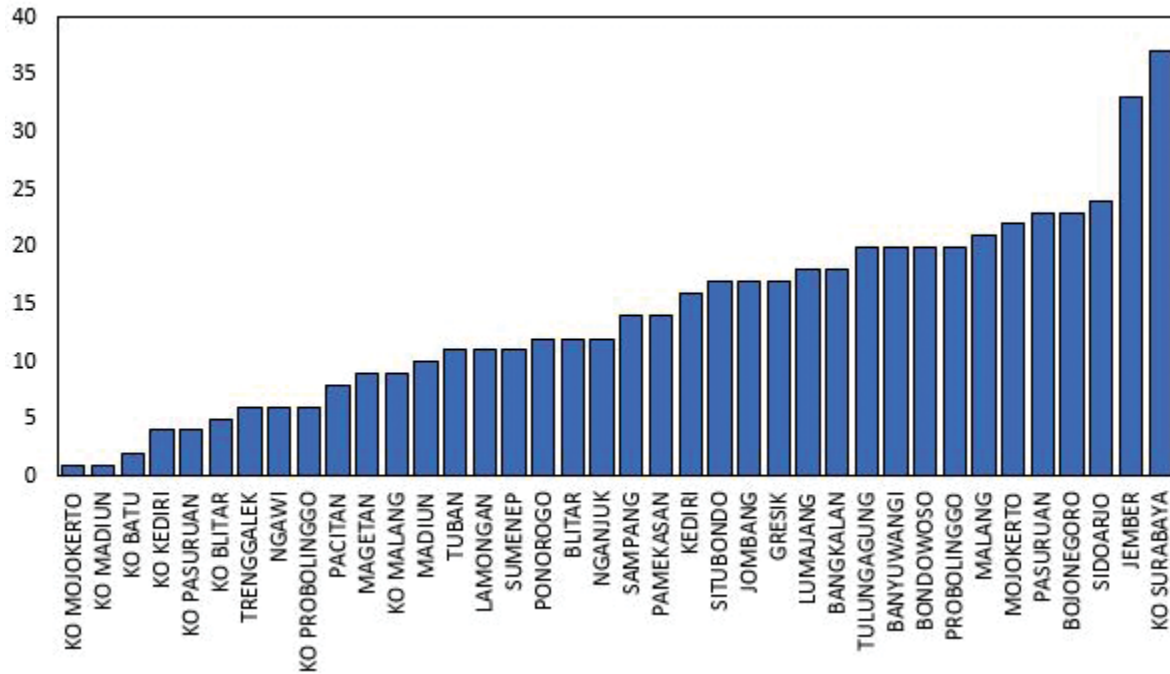


Figure 1: Maternal Mortality Rate (MMR) of cities in East Java Province in 2016

The MMR in Bojonegoro Regency in 2015 amounted to 23 people at 128.2 per 100,000 live births (Figure 2). In 2016 there were 23 people 129.23 per 100,000 live births spread across 19 health centers. In 2017 as many as 17 people spread 100.93 per 100,000 live births in 12 health centers. A total of 30 people spread out 30 health centers from 36 health centers in both urban and rural areas. The direct cause of maternal death in 2017 is heart disease, the accompanying cause, preeclampsia, bleeding, and infection (Figure 3).

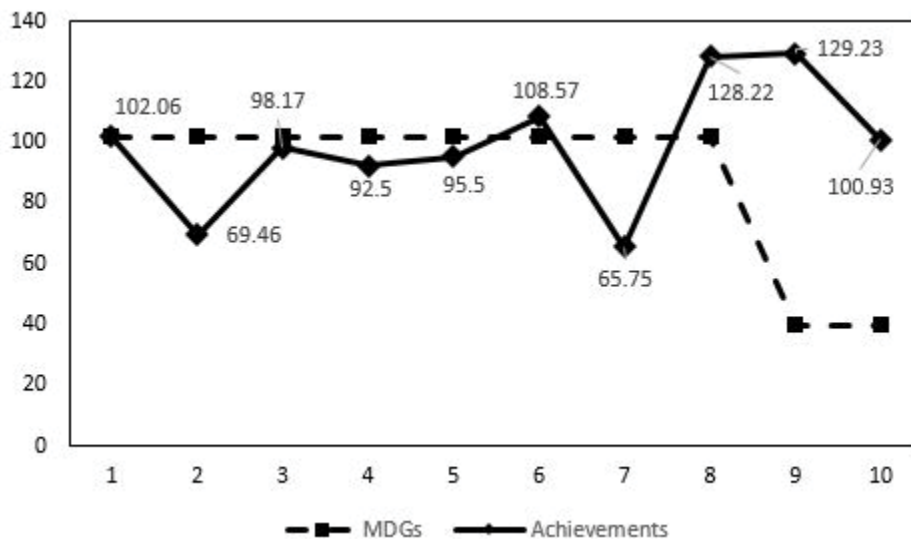


Figure 2: Maternal mortality trend in Bojonegoro Regency

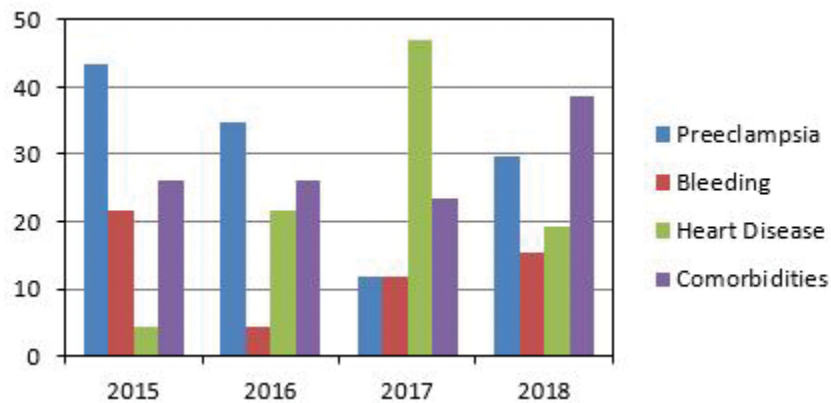


Figure 3: Direct cause of maternal mortality

Indirect causes of maternal deaths from the 2017 health service profile are due to three delays; in making maternal referrals, being late to recognize danger signs and making a decision of 8 people as much as 47.05% and being late and getting adequate services in health care facilities in 3 people at 17.64%. This indirect cause is one of the factors that increases the number of maternal deaths in Bojonegoro district, which has increased. Maternal mortality in the Prenatal period was 5.88%, intranatal was 23.58%, and most of the majority occurred in the postnatal period of 70.59%.

Implementing the P4K (Maternity Planning and Complication Prevention Program) is an effort to reduce MMR<sup>10</sup>. Bojonegoro Regency has 430 alert villages which have village P4K that implement 100% P4K are 28 Puskesmas and 8 The Puskesmas with the village and which are still below the target) 376 villages with working groups are active, and 54 Pokja villages are not running, but the maternal mortality rate is still high.

**Method**

This research was conducted using secondary data on the number of maternal deaths from 2008-2017 for ten years in Bojonegoro Regency for the period of January-December, every year periodic records are carried out every month to one year from 2008-2017. Variable Dependent in this study is the case of maternal death (Y). The collected data was analyzed using the help of a computer program. The stages in the analysis of this study were data exploration, trend analysis stages, and comparing the smallest error values between trend analysis methods by calculating the MAPE, MAD, MSD values.

This trend analysis stage consists of several stages, namely (a) plotting data, using line diagrams

to determine the pattern of the number of deaths each month (b). The parameter estimation stage in several trend analysis methods (C) compares the error values between analysis methods by looking MAPE, MAD, MSD values (d) Forecasting/application stage: carried out if the smallest value and error is obtained from the trend analysis method used.

**Results**

According to Table 1 from Maternal Perinatal Audit data, the number of maternal deaths has fluctuated, but maternal mortality tends to increase.

Table 1: Number of maternal deaths in Bojonegoro Regency in 2008-2017

Year	Number of maternal deaths
2008	19
2009	13
2010	19
2011	24
2012	27
2013	30
2014	19
2015	23
2016	23
2017	17

Source: Perinatal Maternal Audit Report of the Bojonegoro District Health Office in 2008-2017

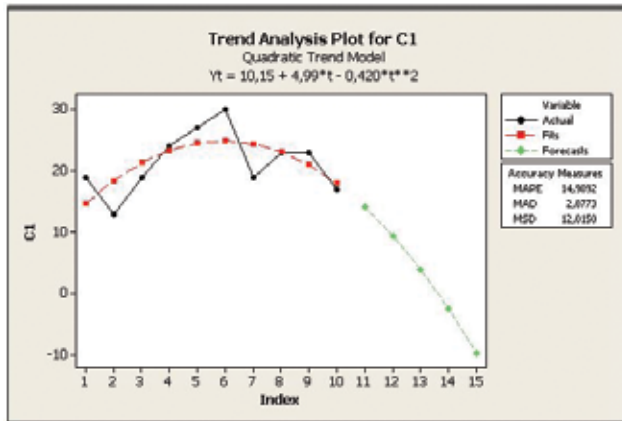
Tren Analysis: The results of the trend analysis above indicate that the smallest MAPE value model is the Quadratic Trend Model (Table 2). The Trend Equation obtained is:

$$(Y_t) = 10.15 + 4.99t - (0.42)t^2$$

After obtaining the best model and the same form. The equation is used to predict the number of maternal deaths; then Figure 4 show the results of the forecasting.

**Table 2: Comparison of Trend Analysis Results**

Trend Model	MAPE	MAD	MSD
Linear Trend Model	18.47	3.67	21.35
Quadratic Trend Model	14.91	2.88	12.01
Growth Curve Model	17.78	3.64	21.83



**Figure 4: Results of the 2018 and 2019 forecast**

The forecasting results of the number of cases of maternal deaths in 2018 decreased by 11.76%, calculated from 2017 and in 2019 an increase of 33.33% in Bojonegoro Regency.

### Discussion

Aligned with the results of the study other than the direct cause of obstetric complications, maternal mortality in Bojonegoro Regency was due to 56.6% of maternal deaths due to three maternal referral delays from 116 cases of mothers referred to the hospital, which supported the increase in the number mother's death in Bojonegoro. The results were found to be late in recognizing danger signs and making the decision that most of the maternal deaths were 62.1% of events compared to mothers who were not late in referring to the incidence of dead mothers in the amount of 13.8%.

According to the Ministry of Health<sup>4</sup>, obstetric complications should be prevented and handled optimally, promptly so that there is no delay in the handling and death of the mother. Delays in the referral process in cases of maternal deaths in Bojonegoro

Regency are indirect causes of maternal deaths. The proportion of indirect maternal deaths in Indonesia is 22%<sup>11</sup>, so prevention before further complications must occur. This study is in line with Biswas et al.<sup>12</sup> that the detection of pregnancy complications by trained professionals and timely referral to a health care facility is useful to save a portion of the baby and the mother's life. Detecting complications during timely pregnancy and referral is not too late referral will guarantee the safety of the mother and baby.

Every pregnant woman has a life-threatening risk even though her pregnancy is healthy, referral to the hospital is a mother who has an obstetrics case that can cause complications directly from the consequences of her pregnancy because 15% of pregnancies and deliveries will be estimated to experience obstetric complications that result in death.

In cases of maternal death, pregnant women are found, including high-risk pregnancies. Mothers with high-risk pregnancies have a higher risk of infant and maternal death and giving birth with congenital abnormalities and other obstetric complications<sup>13</sup>. According to Triana et al.,<sup>11</sup> the Principles for Prevention of maternal deaths are mostly preventable if obstetric complications can be immediately identified and handled, at least three conditions that need to be observed include: 1) Every pregnant woman has a risk of life-threatening obstetric complications because she cannot predict, 2) Access to a risky pregnancy must have adequate access to midwifery services, 3) Maternal mortality occurs mostly during the puerperium or the first 24 hours after delivery. By looking at this statement, the condition of all pregnant women must be adequately monitored, so that there is no delay in recognizing the danger and making decisions to take referral actions.

The local Health Office has made various efforts due to the continuing increase in maternal mortality, starting to mobilize the participation of the community through village alert activities and the implementation of the P4K (Maternity Planning and Complication program) in all Puskesmas districts in Bojonegoro Regency. Throughout Indonesia, by implementing P4K, it is hoped that it can be useful to reduce the incidence of Maternal and Infant Mortality, with the P4K running it will help accelerate village alert functions<sup>10</sup>. However, in this case, it can be seen from the profile of Bojonegoro District Health Office 430 villages were 100% active standby villages

and carried out P4K as much as 87.44% carrying out P4K. In the working group activities in P4K through data collection, it is hoped that efforts to improve early detection of complications can be appropriately handled, through integrated ANC, mentoring by pregnant women cadres, delivery planning according to risk factors, all pregnant women with score more than 6 must be sent at Poned (Emergency Neonatal Obstetric Services Basics) or to the Puskesmas.

### Conclusion

The results of the analysis found that maternal mortality trends increased and even the most in the postnatal period by 70.59% and the forecast results were expected to decline in 2018 calculated from 2017 at 11.76% and in 2019 an increase of 33.33% calculated from 2018. In addition to the direct causes of pregnancy, especially indirect factors, three being late in referral is one of the factors that increases the number of maternal deaths.

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