

Exponential Model For Projecting The Population Of Percentage Of Women Ever Married Under The Age (Less Than 17 Years) Of Alor District In 2030

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Abstract: Every marriage is not only based on biological needs between men and women who are recognized as legitimate, but as executor of the natural process of human life. In addition, marriage is also based on religion, meaning that religious aspects become the main basis of domestic life by carrying out faith and devotion to God. Marriage is a gift from God that needs to be respected and grateful for and presents an atmosphere of peace, order and control in a good and responsible manner. The marriage relationship should be celebrated in sincere love. The impact that will be felt when women marry under age is the chaos of the household to be fostered, there is still dependence, most of which expect a family, the level of domestic violence continues to increase. This will have cross-cutting impacts, namely population explosion, poverty, disruption of economic stability, low levels of education, security stability in terms of domestic violence, infidelity cases and others that have a negative impact.

Keywords: Underage marriage, exponential model.

INTRODUCTION

Marriage is known as a relationship between a man and a woman who have sexual relations, offspring, and divide roles between husband and wife. Every marriage is a biological need between a man and a woman that is recognized as legitimate, marriage should be lived in love, and should be lived according to the natural process of human life. Marriage

should be guided by religious teachings, meaning that religious values become the main basis of domestic life where by exercising faith and devotion to God Almighty.

In order to maintain, protect the family and improve the welfare and happiness of the family, laws governing marriage and family were drafted. Law Number 1 of 1974 concerning Marriage is a law that has privileges, it regulates all members of the community who have reached adulthood who will carry out marriages (Davies & Quinlivan, 2006). Anggraeni (2020) state that the important factor that causes young marriages to be prone to conflict is not age, but mental aspects related to the process of forming a household. Two things that convincingly cause a household to fall apart easily are living together before marriage and giving birth before marriage (Ginting,2008).

The data taken is periodic data, collected according to time from 2015-2020, to describe the population of underage married women (less than 17 years) recorded at the Central Statistics Agency (BPS). This periodic data is used to predict or estimate the population of the number of underage (less than 17 years) married women recorded at the Central Statistics Agency (BPS) in 2030. Furthermore, the forecast data can be useful as a basis for making population equity planning, both short term. , medium, or long-term to suppress the increasing rate of the female population marrying underage (age less than 17 years). The data analysis technique uses the exponential model.

Method

Research Procedure: (1) research design; take data from the Central Statistics Agency for 2016, 2017, 2018, 2019 and 2020; (2) the research targets are the projected population of the Percentage of Women Ever Married Underage (Less than 17 Years) (Percent) in Alor Regency in 2030; (3) data collection techniques at the data collection stage, the steps used, collecting data on the population, the percentage of women who have ever married under age (less than 17 years) (percent) based on data from the Central Statistics Agency for Alor Regency and or the Central Statistics Agency East Nusa Tenggara Province through the internet, then analyze the data and finally draw conclusions.; (4) and data analysis techniques, namely the application of the population exponential model, Percentage of Women Ever Married Underage (Less than 17 Years) (Percent) in Alor Regency in 2030.

RESULTS

1. Exponential Population Model

Maltus's law or the law of exponential growth reads: The rate of growth of a population (microbes, bacteria, insects, humans, animals) is proportional to the current population. If y represents the total population at any time, then Maltus' Law is expressed by:

$$\frac{dy}{dt} = ky \quad 1)$$

By solving $\frac{dy}{dt} = ky$ with the condition that $y = y_0$ when $t = 0$ by separating the variables and integrating, we get

$$\frac{dy}{dt} = ky$$

$$\frac{dy}{y} = kdt$$

$$\int \frac{dy}{y} = \int kdt$$

$$\ln y = kt + C \quad 2)$$

the condition $y = y_0$ at $t = 0$ gives $C = \ln y_0$ so that

$$\ln y - \ln y_0 = kt$$

$$\ln \frac{y}{y_0} = kt \quad 3)$$

So that it is obtained

$$y = y_0 e^{kt} \quad 4)$$

Description

y = population Percentage of Women Ever Married Underage (Less than 17 years)
(Percent) Alor district in 2030 year t

y_0 = population Percentage of Women Ever Married Underage (Less than 17 Years)
(Percent) Alor district in 2030 base year

t = time

When $k > 0$, this type of growth is called exponential growth, and when $k < 0$ is called exponential decay.

2. Central Bureau of Statistics data

Table 1. Data on the percentage of women who have ever married underage (less than 17 years) (percent)

Wilayah	Tahun					
	2015	2016	2017	2018	2019	2020
West Sumba	4.59	4.57	5.6	4.15	6.28	7.11
East Sumba	8.65	10.12	11.22	7.54	13.21	8.04
Kupang	3.19	6.91	8.15	5.44	5.66	5.87
South Central Timor	4.57	6.86	8.29	5.02	4.56	3.35
North Central Timor	3.86	9.61	8.11	5.14	3.17	7.47
Belu	7.52	8.15	10.34	5.14	6.42	8.09
Alor	5.08	5.93	6.65	5.07	5.06	4.02
Lembata	3.77	1.95	3.29	3.70	3.48	2.52
East Flores	2.62	2.49	2.64	4.55	2.01	3.23
Sikka	2.19	2.58	6.28	3.61	2.91	4.13
Ende	3.44	4.66	5.38	3.38	5.42	5.54
Ngada	0.47	0.78	1.99	1.67	2.57	2.84
Manggarai	3.02	4.59	8.44	6.39	5.03	5.89
Rote Ndao	3.89	6.6	7.55	4.12	5.16	8.74
West Manggarai	2.51	9.38	8.31	8.28	2.14	7.28
Central Sumba	6.22	6.34	11.59	7.69	5.98	6.23
Southwest Sumba	5.06	6.58	8.48	8.16	8.81	5.80
Nagekeo	1.50	4.02	2.77	1.03	1.15	1.81
East Manggarai	3.07	3.77	5.42	6.64	3.46	7.07
Sabu Raijua	2.71	6.23	8.27	7.67	10.64	5.57
Malaka	3.97	4.87	4.19	4.17	7.06	3.79
Kupang City	3.40	3.97	3.34	2.60	5.57	3.28
East Nusa Tenggara	3.82	5.55	6.67	5.06	5.11	5.26

Sumber: BPS, Survei Sosial Ekonomi Nasional (Susenas) Maret Source Url:
<https://ntt.bps.go.id/indikator/30/615/1/persentase-perempuan-yang-pernah-kawin-di-bawah-umur-kurang-dari-17-tahun-.html>

Access Time: January 17, 2022, 3:48 pm

<https://ntt.bps.go.id/indikator/30/615/2/persentase-perempuan-yang-pernah-kawin-di-bawah-umur-kurang-dari-17-tahun-.html>

Based on the data obtained by the researcher, the population of women married under age or married under the age of 17 years in the province of East Nusa Tenggara 2015 to 2020 was: in 2015 as many as 3.82%, in 2016 as many as 5.55%, in 2017 as much as 6.67%,

in 2018 as much as 5.06%, in 2019 as much as 5.11%, and in 2020 as much as 5.26%. While the population of women married under age or married under the age of 17 years in Alor district from 2015 to 2020 are: in 2015 as many as 5.06%, in 2016 as many as 5.93%, in 2017 as many as 6.65%, in 2018 as many as 5.07%, in 2019 as much as 5.06%, and in 2020 as much as 4.02% and the average number of the population who married under age (age less than 17 years) from 2015 to 2020 was 5.30% more bigger than the average population of married women under the age of East Nusa Tenggara province as much as 5.25%.

3. Application of the Exponential Model

In table 1 above, for the population the number of women married under age (less than 17 years) 2015 to 2020 in Alor district as shown in table 2 below.

Table 2. Data from the Central Bureau of Statistics on the East Nusa Tenggara Province
on the number of underage married women in Alor district

Year	Central Bureau of Statistics on the East Nusa Tenggara Province
2016	5.93
2017	6.65
2018	5.07
2019	5.06
2020	4.02

Sumber: BPS, Survei Sosial Ekonomi Nasional (Susenas) Maret

Source Url: <https://ntt.bps.go.id/indicator/30/615/1/persentase-perempuan-yang-pernah-kawin-di-bawah-umur-kurang-dari-17-tahun-.html>

Access Time: January 17, 2022, 3:48 pm

The population of women married under age or married under the age of 17 in Alor district from 2016 to 2020 are: 5.93% in 2016, 6.65% in 2017, 2018 as many as 5.07%, in 2019 as much as 5.06%, and in 2020 as much as 4.02% and the average number

of the population who married under age (age less than 17 years) from 2016 to 2020 was 5.35%. This can be seen in Figure 1, below

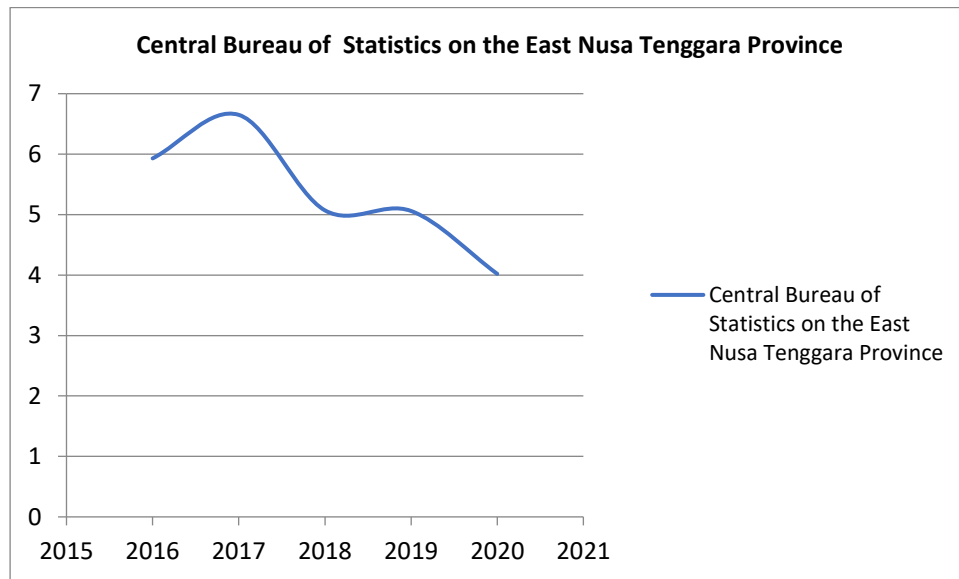


figure 1. Percentage of women who have ever married underage (<17 years), data from the Central Bureau of Statistics on the East Nusa Tenggara Province (in percent)

The next step is the data is presented as a reference basis for forecasting the number of population percentage of underage married women (< 17 years old) in Alor Regency in 2030.

Exponential Model

Looking for the value of K with data from 2016 to 2016, it means that $t = 1$ then we get

$$y = y_0 e^{kt}$$

$$6.65 = 5.93 e^k$$

$$K = \ln \left(\frac{6.65}{5.93} \right)$$

$$K \approx 0.1146$$

The reference base for the year used is 2016 with a population of the percentage of women ever married under the age of (< 17 years old) in Alor Regency 6.65, with $y_0 = 5.93$ so that the formula for the exponential model 1 is obtained, namely

$$y = 5.93 e^{0.1146t}$$

Based on the above calculations, the population projection data for the percentage of underage married women (< 17 years old) in Alor Regency is as follows:

Table 2. Data Prediction

Year	t	y_0	Value of exp	Prediction (y)
2015	0	5.93	0.1146	5.93
2016	1	5.93	0.1146	6.65
2017	2	5.93	0.1146	7.46
2018	3	5.93	0.1146	8.36
2019	4	5.93	0.1146	9.38
2020	5	5.93	0.1146	10.5
2021	6	5.93	0.1146	11.8
2022	7	5.93	0.1146	13.2
2023	8	5.93	0.1146	14.8
2024	9	5.93	0.1146	16.6
2025	10	5.93	0.1146	18.7
2026	11	5.93	0.1146	20.9
2027	12	5.93	0.1146	23.5
2028	13	5.93	0.1146	26.3
2029	14	5.93	0.1146	29.5
2030	15	5.93	0.1146	33.1

The projection results above can be seen in Figure 2 below

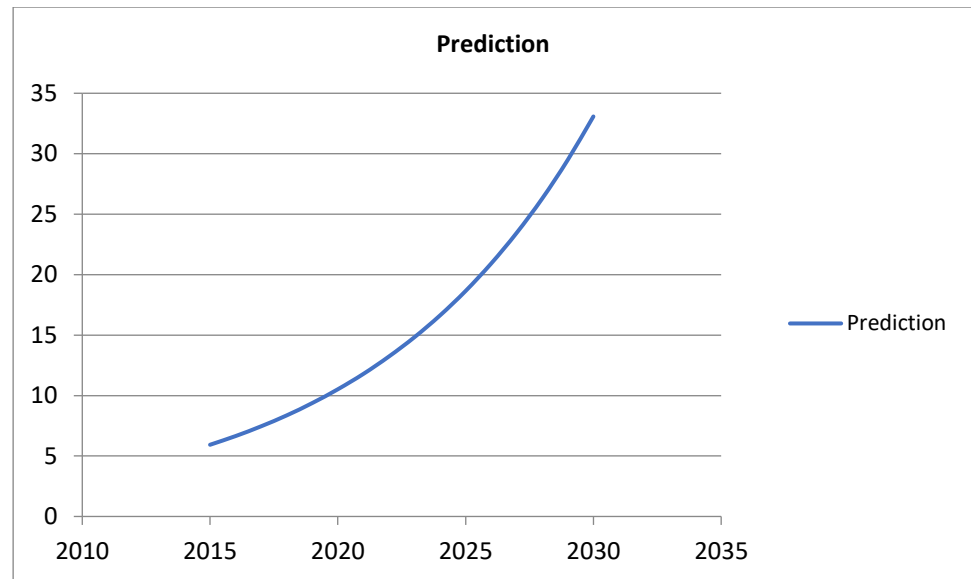


Figure 2. Projection of ever married underage (< 17 years) in Alor District

In 2030, the population of women who have ever married underage (age less than 17 years) in Alor Regency is based on the exponential model formula, when $t=15$, then $y=33.10$. All components need to take strategic steps to reduce the population of underage (less than 17 years old) married women in Alor district. This, based on the exponential model calculation model, increased by 33.10%. This will have an impact on population explosion, poverty, disruption of economic stability, low levels of education, security stability in terms of domestic violence, cases of infidelity and others that have a negative impact (Harianto, 2017).

Discussion

1. Marriage

In Article 1 of Law Number 1 of 1974 it is stated that the purpose of marriage as husband and wife is to form a happy and eternal family (household) based on God Almighty. Furthermore, it was explained that "for that husband and wife need to help and complement each other so that each can develop his personality to help and achieve spiritual and material well-being".

Underage marriage is caused by several influencing factors, including the following:

(a) **pregnant out of wedlock**, (Chavez & Capuro, 2000) states that the factor that causes underage couples to marry is because their partner is pregnant before the marriage is

carried out as a result of too free association, so to cover the family's disgrace, marriage must be carried out immediately. Lack of control from parents over their children where their children are allowed to socialize with everyone without being able to distinguish between good friends and friends who actually plunged him. This is often used by teenagers who get the opportunity to be free to do anything, including romantic relationships that are not actually appropriate for the teenager. This lack of parental control is usually used by teenagers to do the things they want because adolescence is a period of transition from childhood to adolescence. In these teenage years, many children like to try new things or things they have just seen. In a society that adheres to norms, sexual behavior outside of marriage cannot be justified. This behavior is said to be a very forbidden bad act that can damage the values that apply in society.

(b) **economic factors**, the high rate of young marriage is triggered by the low economic capacity of the community or economic difficulties, the weak economic condition of the community causes parents to be unable to send their children to a higher level, to ease the burden on the family, parents prefer to marry off their children with people who are considered capable so that the burden of life is reduced. Due to the reason that the applicant is no longer able to carry out the burden of life, so the last resort is to marry off his child even though he is not old enough and a marriage age dispensation is requested in court (Chavez & Capuro, 2000).

(c) **educational factors**, the higher the education level of parents and families, the lower the occurrence of underage marriages. Because the level of education affects a person's perspective and thought. Parents who have higher education, usually direct their children to achieve higher education, marital affairs are usually second. Because they believe that with a high education that is owned by the child can be a provision for children in the household. With the knowledge they have, children will be able to maintain harmonious family relationships, be able to think critically, and have wisdom. However, on the other hand, parents have a low level of education (Syahrul Mustofa, Preventive Law., p. 120). The thoughts of parents like that are due to educational factors and environmental factors because parents are not used to seeing women working outside the home. This kind of thing is inherent in rural communities. Factors from the environment also affect, usually rural communities consider children who have reached puberty to be married, whereas on the contrary, the legislation regulates the age limit for marriage. Education can influence a woman to delay the age for marriage because there are many things that must be arranged both the economic mentality of the child itself. The longer a person attends school education,

theoretically the higher the age at first marriage (Chavez & Capuro, 2000).

(d). **Parents' worries**, parents' worries about their child's relationship with their partner who is in a relationship too far away, are afraid that it will lead to sin because they do things that are prohibited by religion. Adolescence is a period used by teenagers to get to know more about the surrounding environment and get to know the opposite sex by making friends or dating. Adolescence is also usually used by teenagers to do things that have never been done. The relationship that the child makes with his partner if it is too far or intimate will cause disgrace to the family and the surrounding community will also pay attention to this (Chavez & Capuro, 2000).

(d) **the role of the mass media**, teenagers are groups or groups who are easily influenced because teenagers are looking for self-identity so that they easily imitate or imitate what they see, such as in films or news that are violent, pornographic, and so on. Especially if the freedom of the press and broadcasting makes the media blindly expose deviant behaviors that are "saleable" to be consumed by a wide audience, including teenagers. This is exacerbated by the large number of television stations that broadcast programs that are not educational (Arifin, 2015).

2. Exponential Growth Model

In general, the population model is as in the following equation

$$\left\{ \begin{array}{l} \text{birth rate} \\ \text{population size} \end{array} \right\} = \left\{ \begin{array}{l} \text{birth rate} \\ \text{birth} \end{array} \right\} - \left\{ \begin{array}{l} \text{die speed} \\ \text{death} \end{array} \right\} \quad 5)$$

Equation 5) above will be developed with assumptions and after that, the birth and death processes are expressed as symbols. When we encounter a large population in certain cases, it is assumed that the individuals in a population have the same probability of being born and suppose that the population has the same probability of dying in a certain time interval. For example, the birth rate per capita per capita time and the death rate per capita time are reasonable assumptions (Varberg: 2008).

Suppose the total population at time t is $Y(t)$ and the initial population is y_0 with β birth rate per capita per capita time and α death rate. Assume that the population can only change by

birth and death. Suppose the total population at time t is $Y(t)$ and the initial population is y_0 with a birth rate per capita per capita time and α death rate . Assume that the population can only change by birth and death. Immigration and Emigration are ignored. Since the per capita birth rate β is assumed to be constant, the overall birth rate over time is the per capita birth rate times the current population size. The overall death rate over time is the per capita death rate times the current population size.

$$\left\{ \begin{array}{l} \text{birth rate} \\ \text{birth} \end{array} \right\} = \beta Y(t)$$

$$\left\{ \begin{array}{l} \text{die speed} \\ \text{death} \end{array} \right\} = \alpha Y(t)$$

6)

From equation 6) above, we get

$$\frac{dY}{dt} = \beta Y - \alpha Y$$

$$\frac{dY}{dt} = (\beta - \alpha)Y$$

7)

Note that $Y(t)$ is written as Y . It means Y to t ..

Now we have obtained a differential equation that expresses the rate of change of the population $Y(t)$. Thus, initial conditions are needed to obtain a single solution.

Solve equation 7) for a continuous population. Let $r = \beta - \alpha$, then

$$\frac{dY}{dt} = rY$$

We solve that r is the rate of growth or the rate of growth or the rate of reproduction of the population

$$\frac{dY}{Y} = r dt$$

$$\int \frac{1}{Y} dY = \int r dt$$

$$\ln Y = rt + C$$

$$Y(t) = e^{rt+c}$$

$$Y(t) = e^{rt} e^c$$

With $e^c = K$

So

$$Y(t) = e^{rt}K$$

$$Y(t) = Ke^{rt}$$

By applying the initial condition $Y(t) = y_0$ to obtain the constant value , then we get the solution of the differential equation

$$Y(t) = y_0e^{rt} \tag{8)}$$

From equation 8), there are three cases

- a) $r > 0$, if $t \rightarrow \infty$, then $Y(t)$ approaches infinity.
- b) $r = 0$, then $Y(t) = y_0$. If $t \rightarrow \infty$, then $Y(t) = y_0$ a constant
- c) $r < 0$, if $t \rightarrow \infty$, then $Y(t)$ approaches 0

CONCLUSION

In 2030, the population of women who have ever married underage (age less than 17 years) in Alor Regency is based on the exponential model formula, when $t=15$, then $y=33.10$. All components need to take strategic steps to reduce the population of underage (less than 17 years old) married women in Alor district. This, based on the exponential model calculation model, increased by 33.10%. This will have an impact on population explosion, poverty, disruption of economic stability, low levels of education, security stability in terms of domestic violence, cases of infidelity and others that have a negative impact.

All elements should find the right solution to address the population of underage women marrying. Restrictions on promiscuity, taking seriously the school age of teenagers, guiding and advising teenagers and directing religious activities and or other activities that have the potential to develop the character of teenagers, leading to ways of thinking that can shape them to think about their destiny and future. they.

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