

ISSN (online): 2581-3048 Volume 6, Issue 12, pp 316-321, December-2022 https://doi.org/10.47001/IRJIET/2022.612060

Addressing Teenage Pregnancy and Child Births in Indonesia through Use of Evidence Based Adolescent Health Policies

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Abstract - This research article employs annual time series data of adolescent fertility rate for Indonesia from 1960 to 2020 to predict future trends of adolescent fertility rate over the period 2021 to 2030. The study utilizes Holt's linear exponential smoothing model. The optimal values of smoothing constants α and β are0.9 and0.9 respectively based on minimum MSE. The results of the study indicate that annual adolescent fertility rate will continue to decline throughout the out of sample period. Therefore, we encourage policy makers in Indonesia to continuously promote girl child education, protect the rights of women and girls, and fund youth empowerment projects to improve their labor participation.

Keywords: Exponential smoothing, Forecasting, adolescent fertility rate.

I. INTRODUCTION

Adolescent pregnancy is a public health issue due to its association with adverse health, economic and social outcomes for mothers and children (Astutiet al. 2020; Bostanci-Ergen et al. 2017; Biney & Nyarko, 2017). Pregnancy and child birth are significant contributors to high school dropout rates among teenage girls, 50 percent of teen mothers receive a high school diploma by 22 year of age, whereas approximately 90 percent of woman who do not give birth during adolescent graduate from high school (Soejoenoes, 2017). According to WHO, an estimated 3 million unsafe abortions occur each year leading to maternal morbidity and mortality caused by unintended adolescent pregnancy. In addition, there is a higher risk of adverse health outcomes among babies born to mothers who are below 20 years of age in comparison with those born to mothers aged 20-29 (WHO, 2014). The 2017 Indonesia demographic health survey revealed that the proportion of pregnant teenagers in Indonesia is 58.56% (Indonesia 2017 DHS). The government of Indonesia is committed to addressing the problem of teenage pregnancy and has managed to establish youth centres in 33 provinces that focus on health promotion and prevention which are managed by the Indonesian Family Planning Board: Badan Koordinasi Keluarga Berencana Nasional (BKKBN). In 2015, educational campaigns focused on the importance of delaying marriage, encouraged girl child education, vocational training, and employment to improve income (BKKBN, 2015). This study aims to model and forecast future trends of adolescent fertility for Indonesia using Holt's double exponential smoothing technique. The findings are expected to guide policy making, planning and allocation of resources towards activities which are designed to improve accessibility of SRH services and protecting women's sexual and reproductive health rights.

Author(s)	Торіс	Objectives	Methodology	Findings
Sarder et al. (2021)	Prevalence of	To explore the	Multivariate	women's age,
	unintended	prevalence of	analysis was	wealth index, place
	pregnancy and its	unintended	performed to	of residence,
	associated factors:	pregnancy and	explore the	number of children,
	Evidence from six	explore its	association between	family size, the
	south Asian	determinants among	unintended	intention of
	countries	women of	pregnancy and its	contraceptive use,
		reproductive age in	associated factors.	living with a
		six South Asian		partner, and first

II. LITERATURE REVIEW



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https://doi.org/10.47001/IRJIET/2022.612060

		countries.		cohabitation age are
				essential
				determinants of
				unintended
				pregnancy
Astuti &	Indonesian	Explored	36 interviews were	culture and religion
Hirst(2020)	Adolescents'	Indonesian	completed from	played a powerful
	Experiences During	adolescents'	twenty participants	role in influencing
	Pregnancy and	experiences, as a	using a one-to-one,	adolescents'
	Early Parenthood: a	consequence of	in-depth interviews	behavior
	Qualitative Study	premarital	-	
		pregnancy, during a		
		first pregnancy and		
		early parenthood.		
Rohmah et al.	Determinants of	To analyze the	Binary logistic	age is a significant
(2020).	Teenage Pregnancy	determinants of	regression.	determinant of
	in Indonesia	teenage pregnancy		teenage pregnancy
		in Indonesia.		
Ahinkorah et al.	Prevention of	to identify and	Scoping review	Overall, national
(2020)	Adolescent	review national		policy strengths
	Pregnancy in	policies on the		were seen in
	Anglophone Sub-	prevention of		relation to their
	Saharan Africa: A	adolescent		political
	Scoping Review of	pregnancy in		recognition, and all
	National Policies	Anglophone sub-		aspects of policy
		Saharan Africa		formulation
Mohr et al. (2019)	The Influence of	to review the	Systematic review	Reaching higher
	Educational	association between		levels of education
	Attainment on	education and		deters from teenage
	Teenage Pregnancy	teenage pregnancy		pregnancy in low-
	in Low-Income	in low- and lower-		and lower-middle-
	Countries: A	middle-income		income countries.
	Systematic	countries		
	Literature Review			

III. METHODOLOGY

This study utilizes an exponential smoothing technique to model and forecast future trends of adolescent fertility rate in Indonesia. In exponential smoothing forecasts are generated from the smoothed original series with the most recent historical values having more influence than those in the more distant past as more recent values are allocated more weights than those in the distant past. This study uses the Holt's linear method (Double exponential smoothing) because it is an appropriate technique for modeling linear data.

Holt's double exponential smoothing method is specified as follows:

Model equation

 $A_t = \mu_t + \rho_t \mathbf{t} + \varepsilon_t$

Smoothing equation

 $L_t = \alpha A_t + (1 - \alpha)(L_{t-1} + b_{t-1})$



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0<α<1

Trend estimation equation

 $b_t = \beta (L_t - L_{t-1}) + (1 - \beta)b_{t-1}$

0<β<1

Forecasting equation

 $f_{t+h} = L_t + \mathbf{h}b_t$

 A_t is the actual value of adolescent fertility rate at time t

- ε_t is the time varying **error term**
- μ_t is the time varying mean (**level**) term
- ρ_t is the time varying **slope term**
- \mathbf{t} is the trend component of the time series
- L_t is the exponentially smoothed value of adolescent fertility rate at time t
- α is the exponential smoothing constant for the data
- β is the smoothing constant for trend
- f_{t+h} is the h step ahead forecast
- b_t is the trend estimate at time t
- b_{t-1} is the trend estimate at time t-1

Data Issues

This study is based on annual adolescent fertility rate in Indonesia for the period 1960 - 2020. The out-of-sample forecast covers the period 2021 - 2030. All the data employed in this research paper was gathered from the World Bank online database.

IV. FINDINGS OF THE STUDY

Exponential smoothing Model Summary

Variable	А
Included Observations	61
Smoothing constants	
Alpha (α) for data	0.900
Beta (β) for trend	0.900
Forecast performance measures	
Mean Absolute Error (MAE)	0.653953
Sum Square Error (SSE)	134.549551
Mean Square Error (MSE)	134.549551

Table 1: ES model summary



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Mean Percentage Error (MPE)	0.110207
Mean Absolute Percentage Error (MAPE)	0.696037

Residual Analysis for the Applied Model



Figure 1: Residual analysis

In-sample Forecast for A



Figure 2: In-sample forecast for the A series



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Actual and Smoothed graph for A series



Figure 3: Actual and smoothed graph for A series

Out-of-Sample Forecast for A: Actual and Forecasted Graph



Figure 4: Out-of-sample forecast for A: actual and forecasted graph

Out-of-Sample Forecast for A: Forecasts only

Table 2:	Tabulated	out-of-sample	forecasts
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Year	Forecasted adolescent fertility rate
2021	45.5039
2022	45.0399
2023	44.5759
2024	44.1119
2025	43.6479
2026	43.1840
2027	42.7200
2028	42.2560
2029	41.7920
2030	41.3280

International Research Journal of Innovations in Engineering and Technology (IRJIET)



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The main results of the study are shown in table 1. It is clear that the model is stable as confirmed by evaluation criterion as well as the residual plot of the model shown in figure 1. It is projected that annual adolescent fertility rate will continue to decline throughout the out of sample period.

V. POLICY IMPLICATION & CONCLUSION

South Asia continues to report worrying trends of adverse maternal and child health outcomes. Among the leading drivers of adverse pregnancy outcomes is teenage pregnancy. This problem is known to be associated with adverse SRH outcomes such as obstructed labor, anemia, hypertensive disorders, preterm delivery and low birth weight. Countries like Indonesia continue to report high absolute numbers of teenage pregnancy as a result of challenges such as poverty, low educational level, inadequate SRH knowledge and non-use of modern methods of contraception. Adolescent fertility in Indonesia has been gradually declining over the period 1960-2020 partly due to the national family planning program. This study proposed Holt's double exponential smoothing technique to forecast future trends of adolescent fertility for Indonesia. Our study findings revealed that adolescent fertility will continue to decline throughout the out of sample period. Therefore, the Indonesian government must continuously promote girl child education, protect the rights of women and girls, and fund youth empowerment projects to improve their labor participation.

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Citation of this Article:

Smartson. P. NYONI, Thabani NYONI, "Addressing Teenage Pregnancy and Child Births in Indonesia through Use of Evidence Based Adolescent Health Policies" Published in *International Research Journal of Innovations in Engineering and Technology* - *IRJIET*, Volume 6, Issue 12, pp 316-321, December 2022. Article DOI https://doi.org/10.47001/IRJIET/2022.612060
