Predicting the impact of COVID-19 on fertility in the Special Region of Yogyakarta, Indonesia

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Abstract. The aim of this research is to explain the predicted impact of Covid-19 on fertility in the Special Region of Yogyakarta (DIY). The indicators used are the number of pregnancies and the number of births. To get pregnancy and birth predictions, various basic data were processed using the Spectrum program using the DemProj and Famplan modules, then analyzed by descriptive analysis. The basic data is collected from the Central Statistics Agency (BPS) and other relevant agencies. The result shows that birth and pregnancies in DIY will increase. This prediction is based on the decreasing use of short -term contraceptive methods during the pandemic. In the worst-case scenario, the rise in pregnancies between 2019-2020 would be 67,862 cases, meanwhile births are expected to increase by 37.56 thousand cases during the same period.

1 Introduction

The impact of Covid-19 has affected many aspects of life, including demography [1-4]. One aspect of demography that is affected is fertility [5]. It is predicted that the effect on fertility would increase [4, 5]. The rise in fertility is measured by the number of births and pregnancies.

Prediction on the rise of births is based on the decreasing use of contraceptive methods during the Covid-19 pandemic [7, 8]. During the pandemic, the use of contraceptive tools in Indonesia is expected to decline up to 10 percent [7, 9]. Meanwhile, Maurizio predicted that there will be a reduction of 20 to 40 percent in the use of short-term contraceptive tools (condom, pill, and injection) during the Covid-19 pandemic [10]. Additionally, there is a decrease in family planning service visitation during the Covid-19 pandemic which also contributes to the rise in fertility [11].

The Special Region of Yogyakarta is one of Indonesia's provinces that is affected by Covid-19. On March 21st, 2020 there are only 5 newly confirmed cases, but the trend keeps on increasing until there is a surge to 27.251 cases on February 25, 2021 [12]. The high spikes in cases will potentially affect the fertility aspect. Herawati stated that the Covid-19 pandemic will lead to a baby boom in the Special Region of Yogyakarta [13].

The concern surrounding the increase of fertility in the Special Region of Yogyakarta is an interesting issue to be discussed post 2000. This is because the fertility in the Special Region of Yogyakarta has been fluctuating since 2000 which is reflected in the Total Fertility Rate (TFR). In the period of 2000-2017, fertility in the Special Region of Yogyakarta experience an increase

[14-16], before declining to 1.9 in 2019 [17]. Backed by evidence that Covid-19 has the potential to increase fertility, it raises the concern of the government of the Special Region of Yogyakarta. Therefore, predictions with several scenarios need to be conducted to determine the right policies so that the Special Region of Yogyakarta could achieve its TFR target of 2.1 by 2022.

This study aims to elaborates the prediction of Covid-19 effects on fertility in the Special Region of Yogyakarta using birth and pregnancy indicators. Birth and pregnancy data is processed with indirect methods to yield TFR value. The predicted TFR could then be used as an input for policy determination. Hence, the information regarding the predicted effect on birth and pregnancy becomes essential as input for stakeholders in constructing development scenarios and population planning, especially for the National Population and Family Planning Board (BKKBN) of the Special Region of Yogyakarta.

2 Data and Method

This research is conducted quantitatively and analyzed by descriptive analysis. The Special Region of Yogyakarta is chosen as a study area that is analyzed at the provincial level. The research discussed the prediction of the number of births and pregnancies in 2019-2022 due to the effect of Covid-19 pandemic. The prediction is the result of data processing using Spectrum software. Spectrum is an open source software which was also used by UNFPA to predict the Covid-19 impacts on Maternal Health and Family Planning in Indonesia.

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The data used in this study are obtained from the publications by the Central Bureau of Statistics of the DIY and other secondary sources. These data are then inputted and processed in Spectrum Program Module DemProj and FamPlan. As a limitation of the study, predictions of pregnancy and birth in this study were only built on the assumptions of Maurizio's model, without taking into account other factors such as economic, social and other factors. The model is adopted from the scenario of Maurizio in predicting the Covid-19 impacts on Maternal Health and Family Planning [10]. Maurizio modeled 2 scenarios of Covid-19 impacts in Indonesia in general as follows [10]:

1. Best case scenario which uses the assumption that there is a 20 percent decrease in the usage of short-term contraceptive methods (condom, pill, and injection) in 2020 from the 2019 baseline. The condition would return to normal in the following years of 2021 and 2022 with the estimated numbers similar to those of 2019.
2. Worst case scenario sees a 40 percent drop in short-term contraceptive use (condom, pill, and injection) in 2020 from baseline. The condition would return to normal in the following years of 2021 and 2022 with the estimated numbers similar to those of 2019.

The two scenarios of the Covid-19 impacts then compared to the full coverage scenario, where all main healthcare services are at the same condition as pre-pandemic levels (in this scenario, healthcare services are assumed to be the same for 2019-2022). The result of the data processing using this scenario are:

1) Projection of pregnancies in the Special Region of Yogyakarta in 2019-2022 using the best case scenario, worst case scenario, and the full coverage scenario.
2) Projection of birth cases in the Special Region of Yogyakarta in 2019-2022 using the best case scenario, worst case scenario, and the full coverage scenario.

3 Result and Discussion

3.1 Projection of the Number of Pregnancies in the Special Region of Yogyakarta 2019-2022

The projected number of pregnancies in the Special Region of Yogyakarta continues to rise based on the full coverage scenario, from 109,142 pregnancy cases in 2019 to 112,284 in 2020. With this scenario, there is an increase of 3,142 pregnancies during 2019-2020. This number continues to increase in 2021-2022 (as seen on Figure 1).

The result shows a stark difference in 2019-2020 if compared to the two scenarios conducted by Maurizio. The best case scenario result indicates an increment of 35,297 pregnancies in 2019-2020. Meanwhile the worst case scenario shows an increase of 67,862 cases in 2019-2020. Based on these results, the two scenarios proposed by Maurizio [10], which is reduction in short-term contraceptive use (condom, pill, and injection), has a

significant impact on the surge of pregnancy cases in the Special Region of Yogyakarta.

The predicted pregnancy numbers in the Special Region of Yogyakarta consist of intended and unintended pregnancies. The result of data processing in Spectrum software signifies that unintended pregnancies in the Special Region of Yogyakarta is abundant. The number of unintended pregnancies in the three scenarios is around 60 percent of the total pregnancy cases (as shown in Table 1). This is in accordance with the general conditions that around more than 50 percent of pregnancies are considered unintended pregnancy [18].
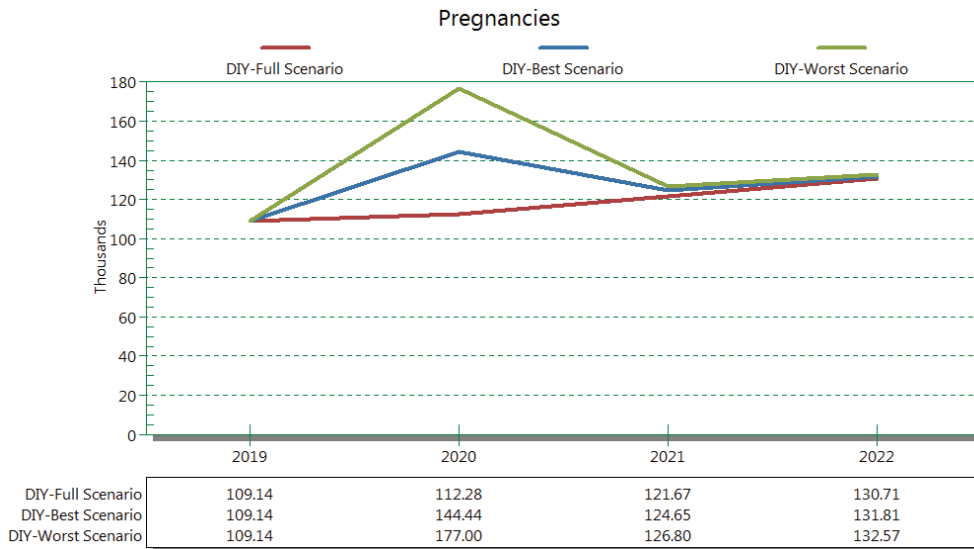
Table 1. Intended and Unintended Pregnancies in Special Region of Yogyakarta 2019-2022, dengan Tiga Skenario

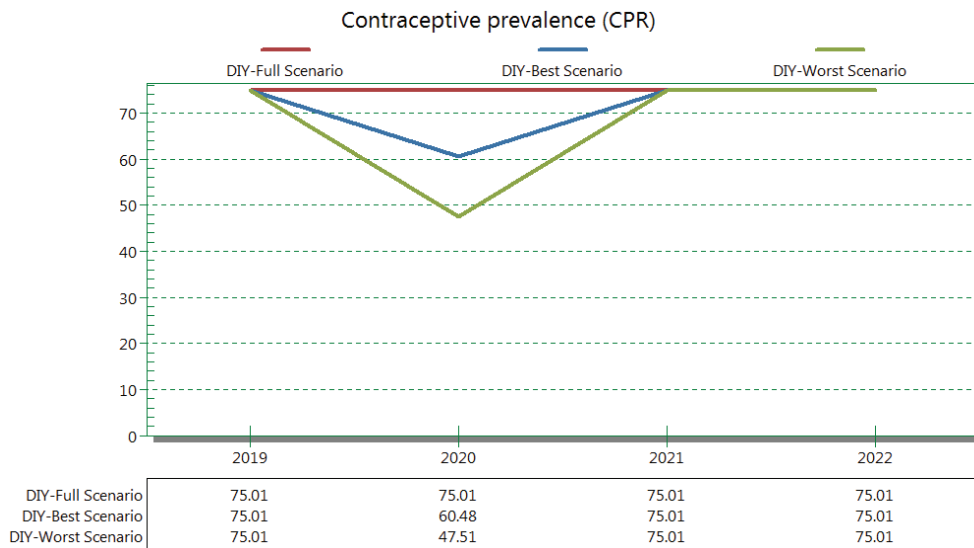|	Pregnancies		
	Intended	Unintended	Total
DIY-Full Scenario			
2019	41,230	67,911	109,142
2020	40,292	71,992	112,284
2021	45,599	76,076	121,674
2022	50,532	80,182	130,714
DIY-Best Scenario			
2019	41,230	67,911	109,142
2020	55,934	88,504	144,439
2021	48,579	76,076	124,655
2022	51,631	80,182	131,813
DIY-Worst Scenario			
2019	41,230	67,911	109,142
2020	71,401	105,603	177,004
2021	50,727	76,076	126,803
2022	52,387	80,182	132,569

Source : secondary data processing

Stover and Winfrey stated that the high cases of unintended pregnancies are mainly caused by an increase in unmet need and failure in contraceptive methods [19]. The findings of Hapsari et al. and Spagnoletti et al. is evidence that the failure in contraceptive methods caused the occurrence of unintended pregnancies in the Special Region of Yogyakarta [20, 21]. Moreover, the decline in Contraceptive Prevalence Rate (CPR) also caused the high cases of unintended pregnancies [22].
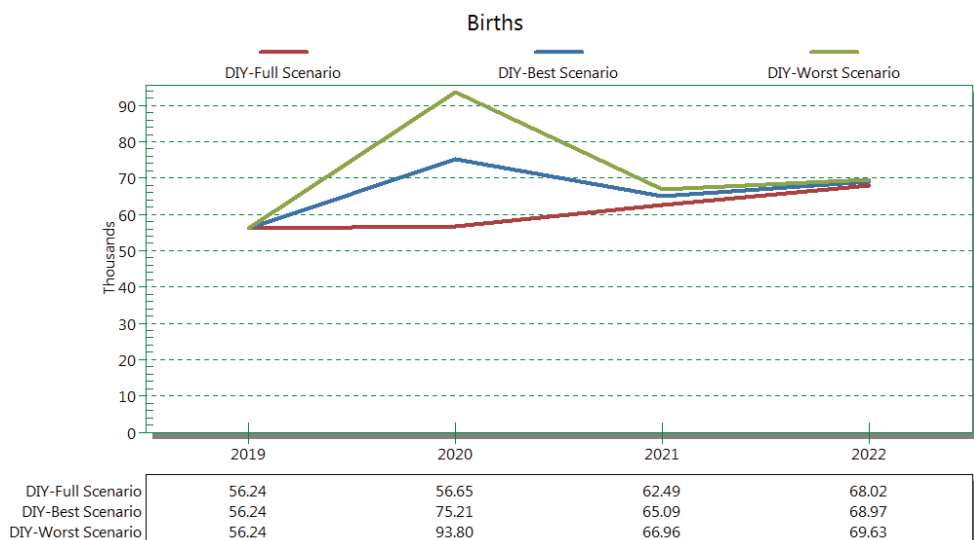
The CPR scenario in the Special Region of Yogyakarta (as seen on Figure 2) is the result of data processing using a Spectrum program with three scenarios. Comparison between the result from CPR scenario and pregnancy scenario shows that the reduction in CPR causes an increase in unintended pregnancies in the Special Region of Yogyakarta, which is in accordance to Lule et al. [22]. Based on Figure 1 and Figure 2, it can be concluded that as CPR decreases in 2020, both in the best case and worst case scenario, will be followed by an increase in pregnancy cases.

Pregnancies

	2019	2020	2021	2022
DIY-Full Scenario	109.14	112.28	121.67	130.71
DIY-Best Scenario	109.14	144.44	124.65	131.81
DIY-Worst Scenario	109.14	177.00	126.80	132.57

Fig. 1. Projection of Pregnancy Cases in the Special Region of Yogyakarta, with Three Scenarios

Contraceptive prevalence (CPR)

	2019	2020	2021	2022
DIY-Full Scenario	75.01	75.01	75.01	75.01
DIY-Best Scenario	75.01	60.48	75.01	75.01
DIY-Worst Scenario	75.01	47.51	75.01	75.01

Fig. 2. Contraceptive Prevalence Rate (CPR) in Special Region of Yogyakarta 2019-2022, with Three Scenarios

Births

	2019	2020	2021	2022
DIY-Full Scenario	56.24	56.65	62.49	68.02
DIY-Best Scenario	56.24	75.21	65.09	68.97
DIY-Worst Scenario	56.24	93.80	66.96	69.63

Fig. 3. Projection of Birth Cases in the Special Region of Yogyakarta 2019-2022, with Three Scenario

3.2 The Number of Births in the Special Region of Yogyakarta 2019-2022

The projection of birth cases in the Special Region of Yogyakarta with the full coverage scenario conveys that there's a rise in 2019-2022. The predicted birth cases range between 56-68 thousand cases (as seen on Figure 3). This value is close to the result of a projection conducted by Indonesia Central Bureau of Statistics, Indonesian Ministry of Development and Planning (Bappenas) and UNFPA, where birth cases are predicted to be around 56-58 thousand cases in 2019-2022 [23].

In the best case scenario and worst case scenario, there's a significant rise of birth cases in 2019-2020. The best case scenario sees a predicted increase of 18.97 thousand birth cases in 2019-2020. Meanwhile the worst case scenario sees a predicted increase of 37.56 thousand birth cases. Compared nationally, the birth cases in Indonesia are predicted by BKKBN to rise by 300-450 thousand cases [24]. Based on this, the Special Region of Yogyakarta contributes around 6-10 percent of total predicted birth cases nationwide.

3.3 The Challenges in fertility aspect due to Covid-19 in Yogyakarta Special Region

Adoption of Maurizio [10] scenario in the case of the Special Region of Yogyakarta gives a good overview of the challenges about fertility due to Covid-19 impacts. As in predicted pregnancies, predicted birth caused by the lowering use of short-term contraceptive methods results in a spike of cases in the Special Region of Yogyakarta. Therefore, the provision of contraception during the pandemics needs to be maintained. This is due to the high potential of rise in pregnancies and births during the Covid-19 pandemic.

That condition corresponds with the findings of Caruso, Rapisarda & Minona and Coombe et al. where several users of short-term contraceptives such as pills decide to discontinue the method when the Covid-19 pandemic occurred [25, 26]. Although sexual activities continue during the pandemics. As a result, some of these users experience unintended pregnancies [25]. Even on a broader scope, the findings of Riley et al. predicted that Covid-19 already caused a reduction in contraceptive use in low and middle income countries and caused pregnancies and births to increase [28].

Predictions of increasing pregnancies and births in the Special Region of Yogyakarta illustrate that the challenges ahead surrounding fertility become an interesting topic to discuss. The Special Region of Yogyakarta's performance as one of the provinces with the best fertility indicator would be disrupted if this condition is not properly controlled [14, 28]. Hence, it's imperative to take steps in minimizing the negative impacts.

Witono and Parwodiwiyono stated that the Special Region of Yogyakarta data indicates a decrease in short-term contraceptive use in the beginning of the Covid-19 pandemic [28]. The lowering use is mostly for pill and injection methods. Based on this evidence, the scenario proposed by Maurizio is very likely to occur in the Special Region of Yogyakarta. Therefore, the provision of contraceptive use during the pandemic needs to be maintained, especially for pills and injections.

Nanda et al. elaborates that the Covid-19 pandemic highlights several challenges ahead, including in the Special Region of Yogyakarta [18]. One example is ensuring the continuity of access and contraceptive services, including counseling and joint decision-making for couples regarding fertility. Nanda et al. also stated that there needs to be several adaptations towards the existing system [18]. This is to ensure that the population's reproductive rights and the state's interest can go hand-in-hand while awaiting for the healthcare system to recover to pre-Covid-19 levels in a short time [29].

Nanda et al. particularly mentioned that adaptive measures can be done through maximizing the "no-touch" approach [18]. The details include using Telehealth for counseling and screening using remote communication methods such as SMS, WhatsApp, video call, or phone call. In addition, access to family planning information already provided such as in the "Klik KB application" or optimization of e-Government tools already provided by the government of the Special Region of Yogyakarta also become important. If this can be implemented by all parties, then the negative impacts of fertility challenges such as surges in pregnancy and birth cases could be minimized.

4 Conclusion

The Special Region of Yogyakarta is one of the provinces in Indonesia with the best fertility achievement. Unfortunately, this performance is expected to be disrupted due to the Covid-19 pandemic. Based on the prediction done by adapting Maurizio approach, the number of pregnancies and births in the Special Region of Yogyakarta is expected to rise. For the pregnancy indicator, the best case scenario prediction shows an increase of 35,297 cases in 2019-2020. Meanwhile the worst case scenario shows an increase of 67,862 pregnancy cases in 2019-2020. For the birth indicator, it is predicted that in 2019-2020, the cases would increase by 18.97 thousand in the best case scenario. Meanwhile in the worst case scenario, the increase is predicted to be 37.56 thousand birth cases in 2019-2020. This indicates that the Special Region of Yogyakarta contributes around 6-10 percent from the total births predicted nationwide.

This finding conveys that fertility in the Special Region of Yogyakarta is expected to increase due to the Covid-19 pandemic. Therefore, several policies need to be immediately implemented to minimize the negative outcomes. One proposed policy is to take adaptive measures towards the current system through maximizing the "no-touch" approach. Optimizing the existing e-Government tools provided by the government of the Special Region of Yogyakarta is also important so that this fertility issue could be controlled properly in the future.

Acknowledgement

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