



**Methodological choices in  
surveys: Effects on pregnancy  
outcomes and deaths**

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# **Methodological choices in surveys: Effects on pregnancy outcomes and deaths**

Report by

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icddr,b

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## ACRONYMS

BMMS	Bangladesh Maternal Mortality and Health Care Survey
DHS	Demographic and Health Survey
DSS	Demographic Surveillance Site
GoB	Government of Bangladesh
icddr,b	International Centre for Diarrhoeal Disease Research, Bangladesh
MICS	Multiple Indicator Cluster Survey
SDG	Sustainable Development Goal
USAID	United States Agency for International Development
WFS	World Fertility Survey

# INTRODUCTION

Globally an estimated 6,700 newborns die every day or 2.4 million newborns die each year, two-thirds during pregnancy and around the time of birth (1). An estimated 2.6 million babies are stillborn (die in the last three months of pregnancy or during childbirth), 2.4 million liveborn babies die within the first 28 days of life (neonatal deaths) (1), and 295,000 women die of pregnancy complications per year (2). According to Sustainable Development Goals (SDGs), by 2030, the global maternal mortality ratio is expected to be less than 70 per 100,000 live births, neonatal mortality is expected to be at least as low as 12 per 1,000 live births and under-5 mortality is expected to reach at least as low as 25 per 1,000 live births (3). In order to track progress of these key indicators we need to obtain accurate count of the birth and pregnancy outcomes (4).

The Government of Bangladesh (GoB) has made commitments toward achieving the SDGs by 2030 (5). Building on a national technological environment, routine data collection system is being strengthened for monitoring and the achievement of SDGs. Alongside, population-based multiple surveys and surveillance including Demographic Health Survey (DHS) (6), Multiple Indicator Cluster Survey (MICS) (7), Sample Vital Registration System (8), and Bangladesh Maternal Mortality and Health Care Survey (BMMS) (9) are conducted periodically at national and sub-national level to report on the key national indicators. Surveys are also sources for adverse pregnancy outcome data including stillbirths, miscarriages, termination of pregnancy.

World Fertility Survey (WFS) initiated collected data on pregnancy history extensively during 1970s (10). Following WFS, its successor, the DHS collects maternal and child health outcome data using birth and pregnancy history (11). Information on both live births and pregnancy losses (i.e., induced abortions, miscarriage, and stillbirths) are collected through investigating pregnancy history whereas birth history collects information from pregnant mothers who gave only live births.

It is well established that pregnancy history has the potential to increase reporting of stillbirths and neonatal deaths than full birth history in high burden contexts although it takes a little longer to be administered than birth history (11, 12). However, it is still not known what strategy to deploy pregnancy history will result in most accurate reporting of pregnancy outcomes. Other methodological differences such as sample size, method of data collection, death and still birth

identification, data quality assurance, adjustments for missing vital events, verification of deaths and timing of interview can also affect the fertility and mortality estimates. The likelihood of misreporting in birth and death counts largely depends on the type of questionnaire, strategy to select the respondent and the type of respondent. Therefore, in this study we aimed to compare selected strategies to capture pregnancy outcomes (live birth, still birth, newborn death) in order to identify the most robust methodology to report accurate outcomes.

## Objective

**General objective:** To identify the effect of the choice of the design to capture counts of birth, newborn death, stillbirth comparing with the Demographic Surveillance Site's (DSS) information

**Specific objectives:**

1. To report the level of undercounting of pregnancy outcomes due to the choice of filters for selecting respondents
2. To identify the level of undercounting of pregnancy outcomes due to the choice of questionnaire (full pregnancy history / truncated pregnancy history)
3. To report the level of undercounting of pregnancy outcomes due to the choice of recall period
4. To observe how long it take to conduct an interview using full and truncated pregnancy history

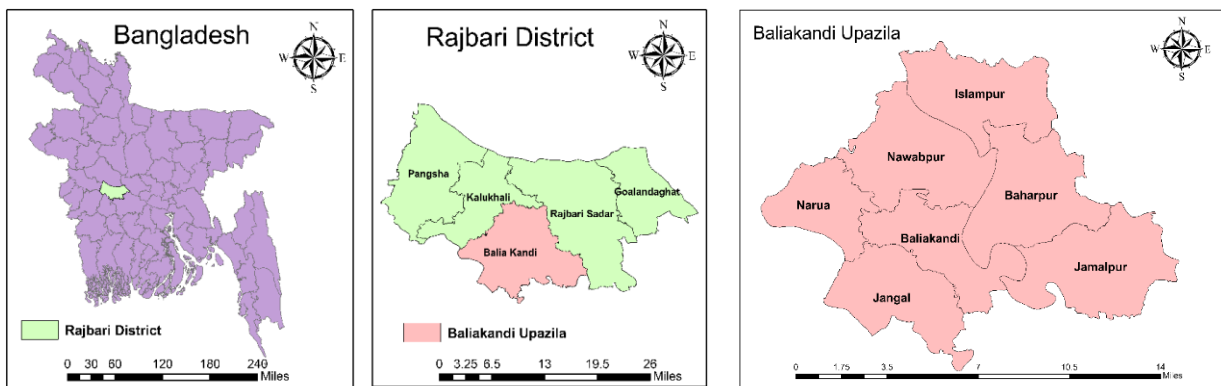


# METHODOLOGY

## Study design and site

The study used a cross sectional household survey to explore different methodologies to capture live and stillbirth, and newborn death. The study was conducted in the Health and Demographic Surveillance sites (HDSS) of icddr,b situated in Baliakandi (**Figure 1**). Since September 2017, icddr,b has been conducting a demographic surveillance program in this area.

**Figure 1: Map of the study site (Baliakandi subdistrict)**



## Methods

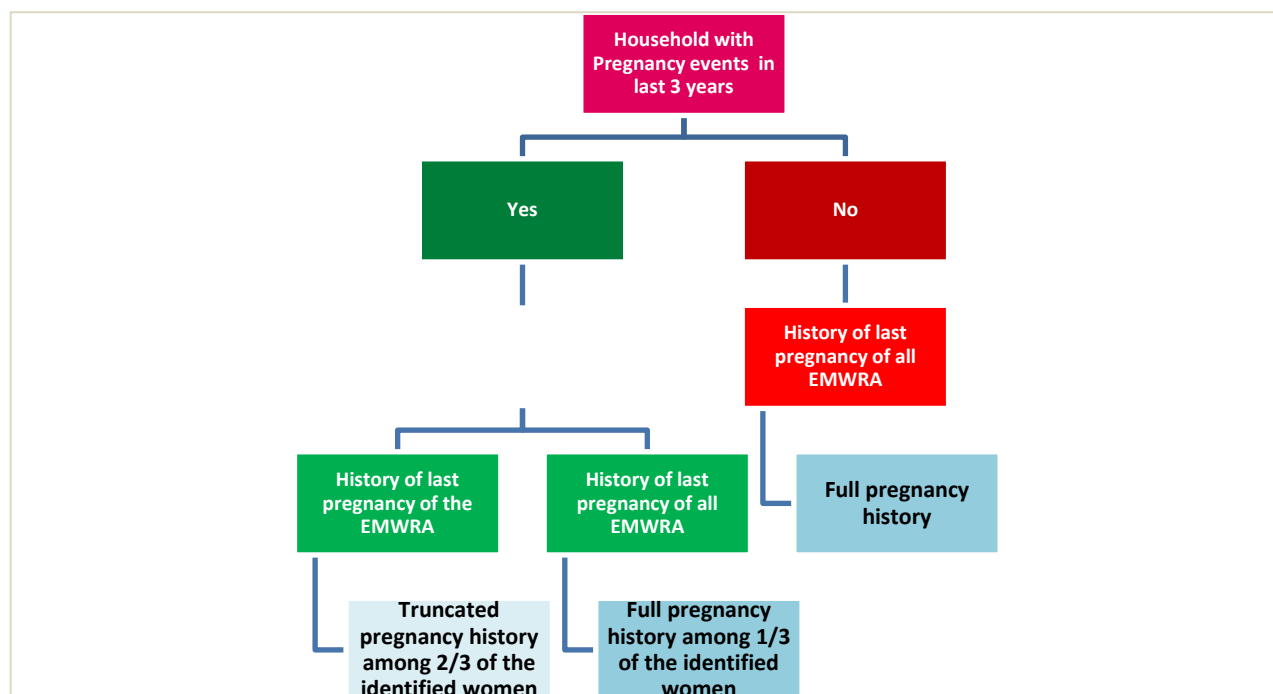
This is a validation study where the HDSS information were considered as the “Gold Standard”.

**Figure 2** presents the flow of the process. In this process we conducted the following steps:

1. In the first stage, we listed household and identified if any pregnancy events were observed in last three years in that household by asking any household members.
2. Then in the second stage, we conducted listing of the members and identified if any pregnancy events were observed in last three years in that household by asking any household members.
3. If any pregnancy event found in last three years we asked the identified women with pregnancy history in last three years.
4. After that we administered the pregnancy history questionnaire to that women in the next phase of the interview.

5. If during the household listing phase in last 3 years no pregnancy is identified, we interviewed them to assess the specificity of the adverse pregnancy outcomes by asking them about the history of their pregnancy.
6. After that, full pregnancy history was administered to see if any pregnancy events were missed or not.

**Figure 2: Flow of the process**



Primary outcome was the sensitivity/specificity of different strategies in recording pregnancy outcomes. We defined sensitivity as the proportion of births and adverse pregnancy outcomes recorded by the HDSS that are also reported as births and adverse pregnancy outcomes during our specific strategy. The specificity is the proportion of pregnancy outcomes recorded as no stillbirth or neonatal death at the time of the survey by the HDSS who were also reported as such during undertaking our specific strategy. Specificity and sensitivity are measured for different strategies.

We selected all households (around 8000 per union) from two unions in Baliakandi Upazila to detect the specificity by taking full unions in addition to the households where newborn deaths and stillbirths are identified from 2019 to 2021 in HDSS. We selected two unions based on the highest number of newborn deaths and stillbirths. However, our data collectors were not be informed about these identified deaths in HDSS. They conducted the interviews independently.

We looked at the record of newborn deaths and stillbirths in the seven unions of Baliakandi upazila for the last three years and decided to select all the households in the Baharpur and Nawabpur unions based on highest number of events happened (newborn death and stillbirth).

## Data collection tools

**Household Listing Tool:** A structured tool used to list all the households in Nawabpur and Baharpur to report the pregnancy events by asking any member.

**Member Listing Tool:** This tool used to list all regular members of all surveyed households from Nawabpur and households where newborn deaths and stillbirths are identified from 2019 to 2021 in HDSS and collect basic demographic information about each household member.

**Full Pregnancy History Questionnaire Used in Demographic and Health Surveys (DHS):** This questionnaire contains respondents background and full history of all pregnancies and their outcomes (including live births, miscarriage, termination of pregnancy and stillbirths)

**Truncated Pregnancy History Questionnaire:** This is defined as the short version of the full pregnancy history. In this study, we collected pregnancy history data of the mothers from the year 2019 to visit of the interview using truncated pregnancy history questionnaire.

Pregnancy history tool were used in Nawabpur union of Baliakandi and the households where newborn deaths and stillbirths are identified in HDSS. Around 1/3 of the women with any pregnancy events in the years from 2019 to interview visit, were interviewed using full pregnancy history along with women who has no pregnancy event in this time. Remaining 2/3 of the women with any pregnancy events in the years from 2019 to interview visit, were interviewed using truncated pregnancy history. These 2/3 of the women selected randomly. Again, women from households where newborn deaths and stillbirths are identified from 2019 to 2021 in HDSS were interviewed using full pregnancy history.

## Data analysis

STATA version 15 was used to perform the quantitative data analysis.

We reported the sensitivity, specificity, positive predictive value and negative predictive value for each outcome in every group. The method with lower deviation from the DSS information was reported as most robust.

## **Ethical consideration and consent**

Ethical approval for the study was obtained from the Institutional Review Board of icddr,b. Written informed consent forms was developed for this study. Consent form confirmed that the participant read the consent Form and agreed to take part in the interview.

## **Funding**

This work was supported by United States Agency for International Development (USAID).

# FINDINGS

About 26% underreporting for last three years was observed if any random person is asked about pregnancy events in last 3 years (**Table 1**).

*Table 1: Pregnancy events identified in the households asking any random person*

		Gold Standard- HDSS Baliakandi		Total
		pregnancy events yes	pregnancy events no	
Documented in our strategies	pregnancy events yes	4779	1325	6104
	pregnancy events no	1644	11299	12943
Total		6423	12943	19047

When we asked household heads about pregnancy events in the last three years, we found that 36% of such events were underreported (**Table 2**).

*Table 2: Pregnancy events identified in the households asking household head*

		Gold Standard- HDSS Baliakandi		Total
		pregnancy events yes	pregnancy events no	
Documented in our strategies	pregnancy events yes	724	233	957
	pregnancy events no	416	2909	3325
Total		1140	3142	4282

When individuals other than the household head were questioned about pregnancy events in the last three years, we observed a 23% underreporting (**Table 3**).

**Table 3: Pregnancy events identified in the households asking other than household head**

		Gold Standard- HDSS Baliakandi		Total
		pregnancy events yes	pregnancy events no	
Documented in our strategies	pregnancy events yes	4055	1092	5147
	pregnancy events no	1228	8390	9618
Total		5283	9482	14765

Around 35% underreporting for last three years was found if male is asked about pregnancy events in last three years (**Table 4**).

**Table 4: Pregnancy events identified in the households asking male**

		Gold Standard- HDSS Baliakandi		Total
		pregnancy events yes	pregnancy events no	
Documented in our strategies	pregnancy events yes	516	140	656
	pregnancy events no	281	1546	1827
Total		797	1686	2483

When females were queried about pregnancy events from the last three years, we identified a 24% underreporting (**Table 5**).

**Table 5: Pregnancy events identified in the households asking female**

		Gold Standard- HDSS Baliakandi		

		pregnancy events yes	pregnancy events no	Total
Documented in our strategies	pregnancy events yes	4261	1185	5446
	pregnancy events no	1363	9749	11112
Total		5624	10934	16558

If we questioned males about pregnancy events in the last year, we observed a 32% underreporting (**Table 6**).

**Table 6: Pregnancy events identified in the households asking male for last one year**

		Gold Standard- HDSS Baliakandi		Total
		pregnancy events yes	pregnancy events no	Total
Documented in our strategies	pregnancy events yes	189	272	461
	pregnancy events no	87	1935	2022
Total		276	2207	2483

When females were questioned about pregnancy events in the last year, a 24% underreporting was identified (**Table 7**).

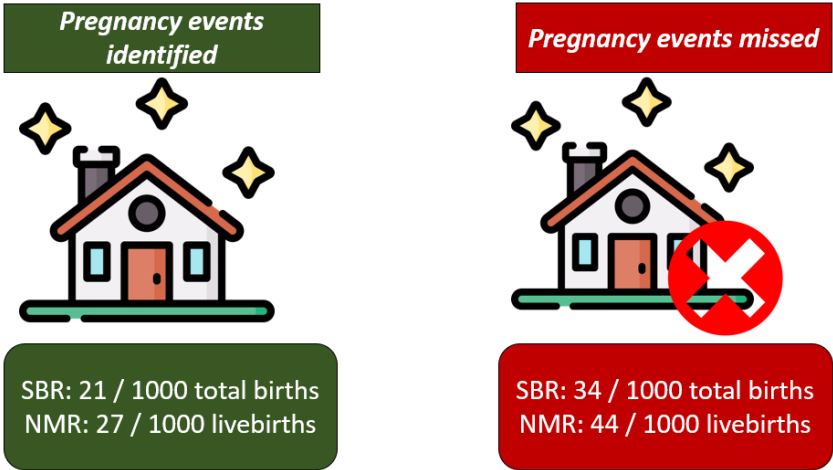
**Table 7: Pregnancy events identified in the households asking female for last one year**

		Gold Standard- HDSS Baliakandi		Total
		pregnancy events yes	pregnancy events no	Total
Documented in our strategies	pregnancy events yes	1429	1930	3359

	pregnancy events no	444	12755	13199
	Total	1873	14685	16558

Among households in our survey with identified pregnancy events, the stillbirth rate (SBR) was reported as 21 per 1,000 total births, and the neonatal mortality rate (NMR) was 27 per 1,000 live births (**Figure 3**). On the other hand, households not identified with pregnancy events in our survey, the Demographic Surveillance System (DSS), reported a higher SBR of 34 per 1,000 total births and a higher NMR of 44 per 1,000 live births.

**Figure 3: SBR and NMR among households identified with pregnancy events and not identified**



We found approximately 3% underreporting in livebirths for the last three years when utilising full pregnancy history and 2% underreporting when employing truncated pregnancy history (**Table 8 and 9**).

**Table 8: Livebirths identified using full pregnancy history**

	Gold Standard- HDSS Baliakandi		
	livebirth yes	livebirth no	Total
livebirth yes	1228	10	1238



Documented in our strategies	livebirth no	42	5807	5849
	Total	1270	5817	7087

**Table 9: Livebirths identified using truncated pregnancy history**

		Gold Standard- HDSS Baliakandi		Total
		livebirth yes	livebirth no	
Documented in our strategies	livebirth yes	1292	0	1292
	livebirth no	18	1081	1099
	Total	1310	1081	2391

Around 22% underreporting in stillbirths was found for last three years for full pregnancy history and 27% when we used truncated pregnancy history (**Table 10 and 11**).

**Table 10: Stillbirths identified using full pregnancy history**

		Gold Standard- HDSS Baliakandi		Total
		stillbirth yes	stillbirth no	
Documented in our strategies	stillbirth yes	163	9	172
	stillbirth no	46	1228	1274
	Total	209	1237	1446

**Table 11: Stillbirths identified using truncated pregnancy history**

		Gold Standard- HDSS Baliakandi		Total
		stillbirth yes	stillbirth no	
Documented in our strategies	stillbirth yes	11	0	11
	stillbirth no	4	1292	1296
	Total	15	1292	1307

We found around 17% underreporting in newborn deaths for the last three years when using full pregnancy history, and 25% underreporting when employing truncated pregnancy history (**Table 12 and 13**).

**Table 12: Neonatal death identified using full pregnancy history**

		Gold Standard- HDSS Baliakandi		Total
		newborn death yes	newborn death no	
Documented in our strategies	newborn death yes	158	10	168
	newborn death no	32	1057	1089
Total		190	1067	1257

**Table 13: Neonatal death identified using truncated pregnancy history**

		Gold Standard- HDSS Baliakandi		Total
		newborn death yes	newborn death no	
Documented in our strategies	newborn death yes	27	0	27
	newborn death no	9	1264	1273
Total		36	1264	1300

We observed approximately 2% underreporting in livebirths for the last year (**Table 14**).

**Table 14: Livebirths identified using truncated pregnancy history for last year**

		Gold Standard- HDSS Baliakandi		Total
		livebirth yes	livebirth no	
	livebirth yes	638	0	638

Documented in our strategies	livebirth no	11	955	966
	Total	649	955	1604

Around 27% underreporting in stillbirths was found for last year (**Table 15**).

**Table 15: Stillbirths identified using truncated pregnancy history for last year**

		Gold Standard- HDSS Baliakandi		Total
		stillbirth yes	stillbirth no	
Documented in our strategies	stillbirth yes	8	0	8
	stillbirth no	3	638	641
	Total	11	638	649

We found approximately 24% underreporting in newborn deaths for the last year (**Table 16**).

**Table 16: Neonatal death identified using truncated pregnancy history for last year**

		Gold Standard- HDSS Baliakandi		Total
		newborn death yes	newborn death no	
Documented in our strategies	newborn death yes	19	0	19
	newborn death no	6	618	624
	Total	25	618	643

The data collection for full pregnancy history, including events within the last 3 years, took averaged 12 minutes per interview (**Table 17**). When collecting full pregnancy history data in cases where there were no events within the last 3 years, the interview took an average of 10 minutes per interview. Data collection using the truncated pregnancy history approach, covering events within the last 3 years, required an average of 13 minutes per interview.

**Table 17: Time took to conduct an interview**

Tool	Time
Full pregnancy history (with event in last 3 years)	12 minutes
Full pregnancy history (without event in last 3 years)	10 minutes
Truncated pregnancy history (3 years)	13 minutes

Asking an eligible women about her full pregnancy history, we missed around 10% relative change in pregnancy events according to DSS information (**Table 18**).

**Table 18: Pregnancy events identified asking eligible women about her full pregnancy history**

Tool	Pregnancy events yes	Total women	%
Full pregnancy history	1162	6792	17
DSS	1295	6792	19

Among the 41 missed newborn deaths in our survey, 17 died on the day of birth and 16 died within the first seven days of life, according to the data from the DSS (**Table 19**). We have captured 10 neonatal deaths that were not matched in DSS. Within this group of 10 deaths, 6 were classified as stillbirths, 3 as post-neonatal deaths, and 1 individual is confirmed as alive according to DSS.

**Table 19: Neonatal death status**

	Gold Standard- HDSS Baliakandi		Total
	newborn death yes	newborn death no	

Documented in our strategies	newborn death yes	185	10	195
	newborn death no	41	2321	2362
	Total	226	2331	2557

Out of 50 missed stillbirths from DSS, 6 were classified as neonatal deaths, 5 were reported to be miscarriages, and 39 were found to be undetected in our survey (**Table 20**). Of the 9 cases identified as stillbirths in our survey, 2 were found as neonatal deaths occurring on the day of birth (day 0) in DSS records, while outcomes for the remaining 7 cases were not found.

**Table 20: Stillbirths status**

		Gold Standard- HDSS Baliakandi		Total
		stillbirth yes	stillbirth no	
Documented in our strategies	stillbirth yes	174	9	183
	stillbirth no	50	2520	2570
	Total	224	2529	2753

## DISCUSSION

The findings outlined in this report provide insight into the nature of underreporting the pregnancy events and related outcomes, as well as the implications of different data collection approaches. These findings have important implications for understanding the accuracy of pregnancy and child mortality data and the potential challenges in obtaining reliable statistics.

The data suggest that when a random person, usually a woman, is asked about pregnancy events over the last three years, there is an underreporting of 26%. On the other hand, when the household head, typically a man, is the respondent, the underreporting level increases to 36%. This difference in reporting between men and women may be because men didn't know much about pregnancy events or reluctance of male respondents to discuss pregnancy events. On the other hand, female respondents show greater accuracy in reporting pregnancy events, possibly due to their direct involvement and knowledge of such events.

When the accuracy of reporting pregnancy events over a three-year recall period is compared to a one-year recall period, the data show that there is no significant difference. This implies that the recall period may have little effect on the accuracy of reporting for these pregnancy events.

The report highlights that missed pregnancy events in the household listing are often associated with a higher number of deaths, as per the Demographic Surveillance System (DSS) data. This underscores the importance of capturing pregnancy events accurately to gain a more comprehensive understanding of maternal and child health outcomes. Families may choose to keep such events private to cope with the emotional impact of pregnancy-related losses and associated pain.

Full pregnancy history in data collection stands out as having higher accuracy in identifying stillbirths and neonatal deaths. Full pregnancy history enables to collect in-depth data regarding every pregnancy, including incidents related to stillbirths and neonatal deaths. The importance of collecting data thorough full pregnancy history tool is emphasised in the report in order to produce more accurate statistics in these crucial areas.

The report highlights that the time implications of collecting data using full pregnancy history versus truncated pregnancy history are negligible. It's also important to note that, in comparison to previous generations, modern trends suggest that women generally have smaller family sizes

or fewer pregnancies. This change in family planning could be the reason for the short time difference.

## **Conclusion and Recommendation**

This study focused on several critical aspects of data collection related to pregnancy events and their outcomes. Female respondents have better accuracy in reporting pregnancy events. Accuracy for three years recall is not much different from one-year recall. The pregnancy events we miss, have more deaths according to DSS. We do not lose livebirth substantially during survey. Full pregnancy history has higher accuracy in capturing stillbirth and newborn deaths. Time implication for full versus truncated pregnancy history is minimal. Early newborn deaths may be missed. Stillbirths and post-neonatal deaths may be misreported as newborn deaths. Stillbirths are often undetected as not reported by the respondent in the survey.

It is important to ensure that data collection teams are well-trained to approach sensitive topics. In discussions regarding maternal and child health, an effort should be made to include both men and women. There are challenges in accurately classifying early newborn deaths, stillbirths, and post-neonatal deaths. Efforts should be made to improve the reporting of these events to obtain more reliable maternal and child health statistics. Perinatal deaths may yield better accuracy if reported.

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## **DISCLAIMER**

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