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Association between unintended pregnancy and stillbirth among women in Zambia: analysis of the Zambia demographic and health survey 2018 data

Shadrick Kahilu Kayeye[1*], Mapoma Christopher Chabila[1]

[1] The University of Zambia, Department of Demography, Population Sciences, Monitoring and Evaluation Lusaka, Zambia; Email skkayeye@gmail.com
[1] The University of Zambia, Department of Demography, Population Sciences, Monitoring and Evaluation, Lusaka, Zambia; Email chabilamapoma@gmail.com

***Correspondence:** Shadrick Kahilu Kayeye, **Email:** skkayeye@gmail.com

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ABSTRACT

In 2021, Zambia's stillbirth rate stood at 14.8 per 1,000 births, surpassing the global target of fewer than 12 stillbirths per 1,000 total births by 2030 (National Institute for Health Research, 2021). This study aimed to investigate the relationship between unintended pregnancy (UP) and stillbirth among women of reproductive age (15–49 years) in Zambia. Unintended pregnancy was defined as pregnancies reported as mistimed or unwanted, while stillbirth was defined as fetal death occurring at or after 28 weeks of gestation. Using secondary data from the 2018 Zambia Demographic Health Survey (ZDHS) with a sample size of 7,672 births, this study applied bivariate analysis and binary logistic regression to identify factors associated with stillbirth. Results showed that UP was significantly associated with a lower risk of stillbirth (AOR = 0.072, p-value = 0.037, 95% CI: 0.006, 0.849). In line with the study's objectives, further analysis revealed significant findings on the interactions between UP, background characteristics, maternal health, and their effects on stillbirth. The interaction between UP and maternal occupation (AOR = 2.949, p-value = 0.027, 95% CI: 1.133, 7.678) and intimate partner violence (AOR = 2.852, p-value = 0.018), was found to significantly increase the risk of stillbirth. Additionally, the interaction between UP and maternal health characteristics, such as limited antenatal care visits (AOR = 7.718, p-value = 0.020, 95% CI: 1.200, 6.779) and smoking (AOR = 38.851, p-value = 0.004, 95% CI: 3.166, 476.714), were found to increase the risk of stillbirth among women with UP. These findings underscore the importance of addressing socio-economic and maternal health factors when tackling stillbirth risk, particularly among women with unintended pregnancies. Interventions aimed at improving antenatal care, reducing intimate partner violence, and implementing tobacco cessation campaigns for pregnant women are essential for reducing stillbirth rates. Further research is necessary to explore the mechanisms linking unintended pregnancy with adverse birth outcomes and to refine public health strategies.

Keywords: Unintended pregnancy, stillbirth, women of childbearing age

INTRODUCTION

Globally, an estimated 2 million babies are stillborn each year, translating to one stillbirth every 16 seconds (UNICEF, 2020). While significant progress has been made in reducing under-five mortality by 50% between 2000 and 2019, the corresponding reduction

in stillbirth rates has lagged at only 36%(UNICEF; WHO; UN, 2020). This disparity underscores the persistent challenges in addressing stillbirth, a critical indicator of the quality of maternal care (Hug et al ., 2021).

Stillbirth rates are shaped by a multitude of risk factors, ranging from congenital anomalies and placental conditions to socioeconomic inequities and access to healthcare. High-income countries often report stillbirths linked to advanced maternal age, obesity, and smoking (FRETTS et al. , 2010). Whereas low-income countries face risks tied to inadequate medical care and nutritional deficiencies (Mukherjee et al., 2023). Despite these variations, women in disadvantaged socioeconomic conditions universally face higher risks, highlighting the urgent need for equity-focused interventions (Bernis et al., 2016).

Although stillbirth imposes a significant burden globally, it has received limited attention in global health agendas. Notably, neither the Millennium Development Goals (MDGs) nor the Sustainable Development Goals (SDGs) include specific stillbirth-related targets (WHO, 2020). Addressing this oversight and prioritizing stillbirth prevention through enhanced maternal care, education, and socioeconomic support could mitigate the plateau in progress observed over the past two decades.

Statement of the Problem

Zambia has seen a slight decline in stillbirths from 14 in 2007 to 12 in 2018, but still ranks among Sub-Saharan Countries with the highest burden of stillbirths (USAID, 2023; NIHR, 2021). The country faces challenges such as incomplete civil and vital statistical registration, which affects the generation of causes of death statistics (MoHA, 2015). This has led to discrepancies in SBRs reported by researchers and institutions including the Ministry of Health (13.6), WHO (14.8) and the 2018 ZDHS estimate of 12, resulting in a lack of information key for estimating the burden of stillbirths in Zambia. Previous studies have shown little in-depth research on the association between uninteded pregnancies (UP) and pregnancy outcomes, with most studies conducted in high-income countries (Hall et al, 2018). The Institute of Medicine committee on UP suggests that a woman with an UP is less likely to seek early prenatal care and is more likely to expose the foetus to harmful substances, potentially leading to adverse birth outcomes (Institute of Medicine , 1995).

The reviewed studies on this subject are still inconclusive on the risk that UP may pose to both the mother and baby. Therefore, a better understanding of the barriers and facilitators that contribute to stillbirths is necessary to improve engagement and quality, leading to better birth outcomes. This created an entry point for this study to determine whether there was an association between UP and stillbirths among women aged 15 to 49 years in Zambia as the country aims to reduce the stillbirth rate to less than 12 per 1,000 women by 2030 in line with the international stillbirths' targets (NIHR, 2021).

Objectives

The main objective of the study was to investigate the association between unintended pregnancy and stillbirths among women of childbearing age, 15 - 49 years in Zambia. The specific objectives are as follows:

- To investigate the effect of UP on stillbirth.
- To investigate the effect of the interactions between UP and background characteristics on stillbirth.
- To investigate the effect of the interactions between UP and maternal health characteristics on stillbirth.

LITERATURE REVIEW

Three patterns have been used to organise the review of literature on stillbirth for this study, which is a worldwide overview, Sub Saharan Africa, and Zambia.

Empirical Review

The relationship between UP and stillbirth has only been the subject of a very small number of studies. Most of these studies were carried out in high-income countries, and the findings are conflicting (Tollman, S.M. et al., 2021). These inconsistencies can be attributed to differences in methodologies used across studies. This study reviewed various studies with different designs, including systematic reviews (Yargwa et al. 2021) that synthesize data from multiple studies, demographic studies (Nelson et al. 2022, Gipson et al. 2008) that rely on population-based samples, and cohort studies (Hal et al. 2017, Mehrabi et al. 2014), that track outcomes over time. In addition, most of the reviewed studies that focused on the relationship between unintended pregnancies (UP) and pregnancy outcomes primarily examined the association between UP and outcomes such as low birth weight and miscarriage, often combining stillbirth and miscarriage as a single variable (Hal et al., 2017; Saedi et al., 2013; Mehrabi et al., 2014; Bain et al., 2020). The potential link between UP and stillbirth specifically received limited attention.

A systematic review of demographic studies in Ghana, Guinea-Bissau, Ethiopia, Uganda and Bangladesh by Yargwa et al (2021), found a significant association between UP and stillbirth. These findings were also supported by other demographic studies, which examined the association between UP and maternal and infant health outcomes such as neonatal mortality, low birth weight and preterm birth including stillbirth (Nelson et al. , 2022; Gipson et al , 2008; Hall et al., 2018; Theme-Filha. et al. , 2016; Tsegaye, 2018). However, other studies found no association between unintended preganacy and stillbirth. A cohort study on pregnancy intention and its relation to maternal, perinatal and neonatal outcomes in low-income settings found no relationship between pregnancy intention and the composite measure of stillbirth (Hall et al., 2018). Similarly, a demographic study conducted in Kenya by the Population Council revealed that UPs were not significantly associated with adverse birth outcomes (Obare et al., 2012). Furthermore, a study conducted in Iran on the relation between time to pregnancy and pregnancy outcome found no relationship between time to pregnancy (TTP) and stillbirths (Mehrabi, A. et al., 2014).

The existence of an association between UP and stillbirth was unclear in light of the contradictory results. This implied that there was still some debate on the relationship between UP and stillbirth, which is why this study was undertaken to investigate the association between UP and stillbirth using the ZDHS 2018 data set.

Global overview of stillbirth

Developed countries have passed the global 2030 target of 12 stillbirth per 1000 total births (Flenady et al., 2016), largely due to better prenatal and perinatal care. Countries like Northern America, Australia, and New Zealand have lower stillbirth rates, while Finland and Singapore have the lowest (UNICEF; WHO; UN, 2020). Europe has a lower stillbirth rate than the average in SSA (UNICEF, 2020). The significant decline in stillbirth rates can be attributed to strong health systems and high-quality care, hence the need for more investments in quality antenatal and delivery care in low-middle income countries.

Literature highlights several successful interventions in developed countries that could be adapted to low-income settings to reduce stillbirth rates. Developed countries, such as those in Europe, North America, and Australia, have seen significant reductions in stillbirth rates, primarily due to comprehensive healthcare strategies. Key interventions include enhanced antenatal care, where routine screenings for conditions like gestational diabetes, hypertension, and infections have been shown to reduce stillbirth rates by enabling early detection and management (Gibson et al., 2020).

Adapting these interventions to low-income settings requires contextual adjustments. For instance, integrating mobile health technologies can bridge gaps in access to care, especially in remote areas, while community health worker programs could ensure that

essential care is provided in underserved regions (Patel et al., 2021). By implementing these evidence-based strategies in resource-constrained settings, low-income countries can reduce stillbirth rates and improve maternal and neonatal health outcomes.

Sub-Saharan Africa

Sub-Saharan Africa (SSA) continues to bear the highest burden of stillbirths globally, with eight of the ten countries with the highest stillbirth rates located in the region (Mukherjee et al., 2023). The disparity in stillbirth rates between regions is stark. In 2019, stillbirths per 1,000 live births ranged from 22.8 in West and Central Africa to just 2.9 in Western Europe, with Southern Africa, Eastern, and Central Africa reporting the second and third highest rates, respectively (Hug et al., 2021). This situation highlights not only the severity of the issue in SSA but also the vast inequality in maternal and neonatal health outcomes across different regions.

One of the key challenges in SSA is the lack of comprehensive data on the causes of stillbirth. Systematic reviews have shown a significant gap in primary data collection and standardized techniques for documenting stillbirths. Studies argue that one of the first steps in addressing the stillbirth crisis in SSA is to close these data gaps and improve the quality of data collection (Aminu et al., 2019; Bedwell et al., 2021). Without accurate and standardized data, it remains difficult to identify specific risk factors or monitor trends effectively. In some cases, the lack of proper documentation has led to underreporting, further exacerbating the challenge.

Local health policies also play a critical role in shaping the effectiveness of interventions aimed at reducing stillbirth rates. Many SSA countries have limited resources to invest in maternal and neonatal healthcare, which affects the implementation and sustainability of interventions. Therefore, improving access to skilled birth attendants, enhancing maternity care facilities, and expanding access to antenatal care are crucial steps in preventing stillbirths (Aminu et al., 2019; Mukherjee et al., 2023). However, these efforts are often hindered by systemic issues such as underfunded health systems, political instability, and lack of trained healthcare personnel (Bedwell et al., 2021; Tesema et al., 2021). These barriers have significantly limited the impact of policies aimed at improving maternal and neonatal health outcomes in the SSA region.

Despite these challenges, there are examples of innovative approaches being implemented in SSA to address stillbirths. Some countries have introduced community-based programs that focus on educating pregnant women about the importance of antenatal care and early detection of pregnancy complications (Lucia et al., 2019). Additionally, there has been an increasing push for the use of mobile health technology to improve access to information and care, particularly in rural areas (Aminu, 2017; Gebrselassie et al., 2020). These efforts, although still in their early stages, show promise in reducing stillbirth rates and improving maternal health outcomes in SSA (Froen et al., 2011; UNICEF, 2020). However, continued investment and support are necessary for these programs to be scaled and sustained across the region. The analysis of the available literature on the issue of stillbirth in SSA has revealed that the rate of improvement in lowering SBR has been incredibly slow.

Stillbirths in Zambia

Zambia is one of the countries in sub-Saharan Africa (SSA) with a high stillbirth rate (Bedwell et al., 2021). The World Health Organization (WHO) reported Zambia's stillbirth rate at 14.8 per 1,000 total births in 2019, a decrease from 19.6 in 2004. Despite this decrease, the Zambia Demographic and Health Survey (ZDHS) data shows minimal advancements in Zambia’s stillbirth rate (SBR), with only a 2 per 1,000 live birth reduction over the past decade. Specifically, the SBR fell from 14 in 2007 to 13 in 2013/14 and 12 in 2018 (ZDHS, 2018). However, the Ministry of Health's 2017–2020 annual report indicated a nationwide SBR of 14.5 per 1,000 live births in medical facilities in 2020, which represents a rise from 13.6 in 2019. This suggests that

improvements made in 2018–2019 were reversed in 2020, signaling an urgent need for targeted interventions.

Despite significant data on stillbirth risk factors in Zambia, such as inadequate healthcare infrastructure, lack of skilled birth attendants, maternal age, history of stillbirth, untreated maternal syphilis, low birth weight, and poor antenatal care (Miyoshi et al., 2019; NIHR, 2021), a critical gap remains in understanding the specific relationship between unintended pregnancies (UP) and stillbirth in Zambia. Demographic studies across SSA, including Zambia, have identified rural residence and low socio-economic status as major determinants of unintended pregnancies (Alem et al., 2022; Amo et al., 2016). However, studies on how unintended pregnancies specifically affect stillbirth rates are sparse. Moreover, research studies such as the cross-sectional study by Lasong et al. (2020), which examined modern contraceptive use in rural Zambia, did not explore the link between unintended pregnancies and stillbirth, despite its relevance. Similarly, Mutumbi's (2013) hospital-based study on unintended pregnancies did not find significant differences in stillbirth outcomes, largely because it did not explore other important factors such as socio-economic conditions and healthcare access, which may influence the risk of stillbirth in the context of unintended pregnancies.

There is also a noticeable lack of latest studies that have used the Zambia Demographic and Health Survey (ZDHS) data to explore the relationship between unintended pregnancies and stillbirth specifically. The ZDHS provides a rich source of demographic and health data, yet it has not been fully leveraged to explore how unintended pregnancies contribute to stillbirth rates in Zambia.

This study aimed to fill these gaps by specifically investigating how unintended pregnancies contribute to the risk of stillbirth in Zambia. It utilised the ZDHS 2018 dataset, which offers detailed data from a large, nationally representative sample of women across Zambia. By using this dataset, the study explored the socio-economic and healthcare-related factors that influenced the risk of stillbirth in the context of unintended pregnancies.

Theoretical Framework

The theoretical foundation for this study is grounded in the framework for the analysis of child survival developed by Mosley and Chen (1984). This framework focuses on the relationship between social, economic, and biological factors affecting child mortality, particularly through proximate determinants. Mosley and Chen (1984) argue that all social and economic factors impacting children's mortality influence the risk of morbidity and mortality through a set of intermediate, or proximate, determinants. These proximate determinants, such as maternal health, access to healthcare, and environmental factors are key to understanding how broader social and economic factors interact to influence child survival. This framework was instrumental in shaping the study's methodology, guiding the identification of key variables to investigate the role of unintended pregnancy (UP) in stillbirth rates.

This study also draws upon the conceptual framework by Gipson et al. (2008), which aligns with the Mosley and Chen framework but further elaborates on the influence of unintended pregnancies (UP) on maternal health and birth outcomes. Gipson et al. (2008) argue that factors related to UP, such as delayed initiation of antenatal care, insufficient prenatal visits, unhealthy maternal behaviors, and psychosocial stress contribute significantly to adverse birth outcomes, including stillbirth. This framework helps to clarify the pathways through which UP may impact stillbirths, such as through maternal health behaviors or environmental conditions. The conceptual framework for this study was therefore adapted from Gipson et al. (2008), and it incorporates both proximate determinants of maternal health (e.g., intimate partner violence, smoking, and access to healthcare) and background socio-economic factors (e.g., education, wealth, and residence).

Application to Methodology and Variables

The theoretical and conceptual frameworks directly informed the methodology and variable selection for this study. The analysis of the child survival framework underscored the importance of investigating both micro (individual, household) and macro (community, societal) factors as potential determinants of stillbirth. These factors included maternal health behaviors, socio-economic status, and access to maternal healthcare, which were incorporated into the study's analysis. The inclusion of proximate determinants such as smoking, intimate partner violence (IPV), and access to healthcare variables identified in both Mosley and Chen's and Gipson et al.'s frameworks reflected the operationalization of the framework's key concepts.

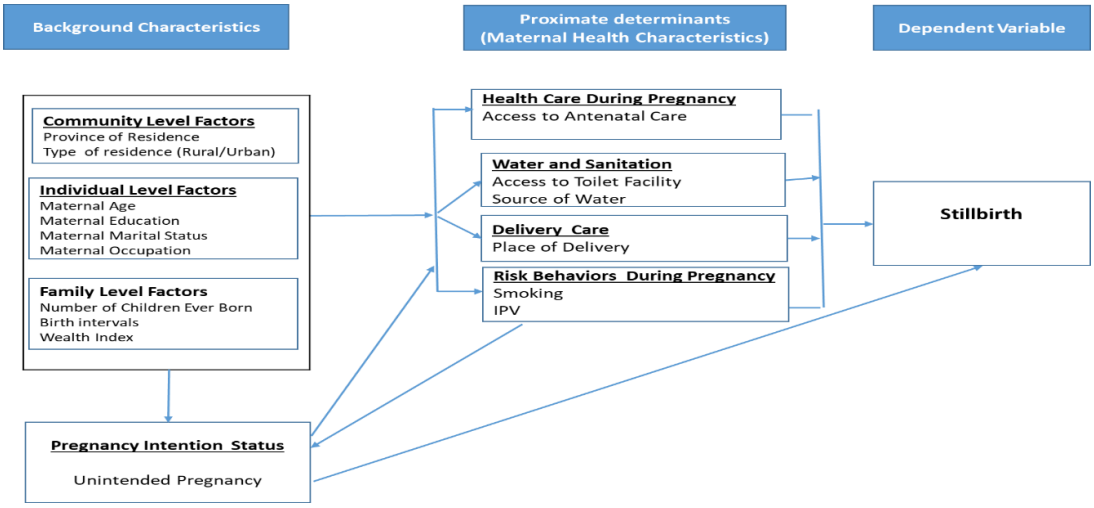
The main independent variable in this study was UP, a core component of the Gipson et al. (2008) framework. This framework linked pregnancy status (i.e., unintended pregnancies) to both background factors (e.g., socio-economic status, marital status, maternal education) and maternal health behaviors (e.g., smoking, IPV, and prenatal care). As per the theoretical model, UP was hypothesized to influence stillbirth through both direct and indirect pathways. The interaction between UP and these background and maternal health factors was examined to determine whether UP increased the risk of stillbirth via these proximate determinants. This conceptual approach was essential for exploring stillbirth in Zambia and its links to unintended pregnancies.

Contribution to the Study's Analysis

The frameworks directly informed how the study analyzed the relationship between UP and stillbirth. By focusing on the direct link between unintended pregnancies and stillbirth, and through the interaction between unintended pregnancies and various socio-economic and maternal health factors, the study explored how these factors collectively influenced stillbirth outcomes. The study used the variables identified in the frameworks, such as maternal age, education, marital status, wealth index, place of residence, and maternal health behaviors (e.g., smoking, IPV), to assess their influence on the likelihood of stillbirth among women of childbearing age with unintended pregnancies.

In summary, the application of Mosley and Chen's (1984) framework and Gipson et al.'s (2008) modified framework provided a comprehensive foundation for understanding the factors that contributed to stillbirth. These frameworks guided both the variable selection, and the analysis of how unintended pregnancies may have increased the risk of stillbirth through various social and economic pathways.

Figure 1: Conceptual Framework



Adapted from Jessica D Gipson, Michael A Koenig, Michelle J Hindin (2008) and Mosely and Chen (1984).

METHODOLOGY

Study Design

This study made use of a non-interventional research design. The data already existed, and the design was suitable because it completely captured all the events of interest that would address the study's objectives. The study used secondary data from the 2018 Zambia Demographic and Health Survey.

Sampling Method and Sample Size

The study selected women aged 15-49 from the Demographic Health Survey Individual Record file, based on pregnancy in the preceding five years. The sample was limited to, intended or unintended births in the last five years and 49 missing cases on pregnancy intention were removed. A weighted sample of 9869 births was selected for purposes of analysis.

Operational Definition and Measurement of Variables

Table 1 Operational Definition Framework

Variable in ZDHS	Conceptual Definition	Questions	Description	Measurement
Stillbirth **(Outcome Variable)**	The outcome of the foetus after birth ((≥28 completed weeks of gestation), which is classified as "Stillbirth" and "live birth	Have you ever had a pregnancy, which ended in a stillbirth?	0. No 1. Yes	Nominal
Unintended Pregnancy (**Main Independent Variable)**	Whether the pregnancy was mistimed or unwanted at the time of pregnancy	Did you intend to have a baby at the time you got pregnant?	1= Yes 2= No	Nominal

Maternal Education	Highest level of education a woman attained at the time of the survey	What is the highest level of education you have attained?	1. No Education 2. Primary 3.Secondary and higher	Ordinal
Wealth Status	Composite measure of the household's cumulative goods which defined the living standard of the women at the time of the survey	How would you describe your household economic condition?	0. Poor 1. Middle 2. Rich	Ordinal
Maternal Occupation	Occupation of the woman at the time of the survey	What is your occupation?	1. Not Working 2. Unskilled Labour 3. Skilled Labour	Nominal
Maternal Age	Age of the mother at the time of the survey	How old were you at your last birthday?	1. ≤ 24 2. 25-34 3. 35+	Ordinal
Marital Status	Marriage status at the time of the survey	What is your marital status?	1. Married 2. Not in a marital union (combines the single, separated, divorced, and widowed)	Nominal
Children Ever Born	Number of children ever born to a woman at the time of the survey	How many children have you given birth to?	2.1-2 children 2. 3-4 children 3. 5 + children	Ordinal
Birth Interval	The difference in months between the current birth and the previous birth	What is the difference in months between the current birth and the previous birth?	1. 8-12 months 2. 13-24 months 3. 25+ months	Nominal
Residence	Place of residence at the time of the survey	Do you reside in rural or urban areas?	1. Urban 2. Rural	Nominal
Province of Residence	Geographical province or region of residence at the time of the survey		Central 1 Copperbelt 2Eastern 3Luapula	Nominal

		What is your province of residence?	4Lusaka 5Muchinga 6 Northern 7North-western 8 Southern 9Western 10	
Intimate Partner Violence	Women who experienced IPV	Did you experience physical OR sexual OR emotional violence from any partner	0. No 1. Yes	Nominal
Smoking	Mothers Smoking of tobacco or cigarettes	Do you smoke or use any other type of tobacco?	0. No 1. Yes	Nominal
Antenatal Care	Number of times a woman accessed antenatal care during pregnancy	How many times did you receive antenatal care during this pregnancy?	1. 0-4 visits 2. 5+ visits	Nominal
Birth Place	Place where the stillborn child was delivered from	Where did you give birth from?	1. Health Facility 2. Home and Other	Nominal
Access to a toilet	Availability of toilet facilities at the household during the survey	Do you have a toilet facility?	1.Yes 2. No	Nominal
Source of Water	Source of water source at household level	What is the source of water for your household?	1. Ground Water 2. Surface Water and others	Nominal

Table 2 DHS Coding Table

Variable Coding

Variable in ZDHS	Variable Name in ZDHS	ZDHS Coding	Variable New Coding Explanation	(New codes for the purpose of analysis)
Stillbirth	Stillbirths	Not Coded in ZDHS	The response option for women who had a pregnancy, which ended in stillbirth, was Yes	0= No 1= Yes

			denoted by one (1), and No denoted by zero (0), for pregnancies, which did not end in a stillbirth.	
UP	M10_1	1. Then 2. Later 3. No more	The ZDHS response options "Later" representing mistimed and "No more" representing unwanted pregnancies were merged to create the UP response option. The response option "Then" was maintained as intended pregnancy.	1. Yes 2. No
Maternal Education	V106	0. No education 1. Primary 2. Secondary 3. Higher	The response option for secondary and higher were collapsed into one category because the stillbirth among the higher education category were low (Stillbirth = 8).	1. No Education 2. Primary 3.Secondary and higher
Wealth Status	V190	1. Poorest 2. Poorer 3. Middle 4. Richer 5. Richest	Poorest and poorer were collapsed into poor and, rich and richest were collapsed into rich to make it more comparable with the studies reviewed studies	1. Poor 2. Middle 3. Rich
Maternal Occupation	V717	(0)Not working,(1)Professional /technical/managerial (2)Clerical, (3)Sales, (4)Agricultural – self- (5)Agricultural employ (6)Household and domestic (7) Services (8)Skilled manual (9)Unskilled manual	Three response options were created for this variable. Women who worked in jobs that require training e.g. Professional/technical/managerial, clerks, sales were added to the "Skilled Labour" category while those who did manual work without any training were added to "Unskilled Labour" e.g. domestic workers. The three categories were informed by literature for easy of comparison and analysis	0. Not Working 1. Unskilled Labour 2. Skilled Labour

Maternal Age	V013	1. 15-19, 2. 20-24, 3. 25-29, 4. 30-34, 5. 35-39, 6. 40-44 7. 45-49	The age groups were re-grouped into three categories. This is because literature indicates that women who are either below 24 years of age or above 35 years of age are at increased risk of stillbirth.	1. 15-24 2. 25-34 3. 35+
Marital Status	V501	0. Never in union 1. Married 2. Living with partner 3. Widowed 4. Divorced 5. No longer living together/separated	Women that were not in a marital union at the time of survey, which includes those that were Never in a Union, divorced, No longer living together/separated and living with partner were grouped into the "Unmarried" response category while those that were married were maintained as the Married. Total stillbirths among the new coded "unmarried" response category were only 28 compared to about 122 among the married category. Literature shows that compared with births from married women, births from unmarried women were at an increased risk of stillbirths.	1. Married 2. Not in a marital union
Children ever born	V201	Not coded (Numeric)	Women who had a total of 1 to 2, children were coded as 1, women with 3-4 children ever born were coded as 2 and women with 5 or more children were coded as 3. Literature shows that births from women with 5 or more children are at an increased risk of stillbirths.	1).1-2 children 2. 3-4 children 3. 5 + children
Birth intervals	B11_01	Not coded (Numeric)	Women who gave birth after 8 to 12 months between the previous and current births were given the code 1, those after 13 to 24 months received the code 2, and those after 25 months or more were given the code 3. Literature shows that the shorter the birth interval the higher the risk of	1.8-12 months 2.13-24 months 3. 25+ months

			stillbirths. Three main response categories were created.	
Residence	V025	1. Urban 2. Rural	Codes in ZDHS were maintained	1.Urban 2.Rural
Province of Residence	V024	(1) Central (2) Copperbelt (3) Eastern (4) Luapula (5) Lusaka (6) Northern (7) North-western (8) Southern (9) Western	Codes in ZDHS were maintained	(1) Central (2) Copperbelt (3) Eastern (4) Luapula (5) Lusaka (6) Northern (7) North-western (8) Southern (9) Western
Intimate Partner Violence	Domestic Violence Module	D103 A to D104 (Emotional Violence), D105A to D108 (Physical and Sexual violence)	Maintained codes created after creating variable for experienced physical OR sexual OR emotional violence by any partner	0. No 1. Yes
Smoking	V463A	Hasn't changed	Codes in ZDHS were maintained	0. No 1. Yes
Antenatal Care	M14_1	Not coded (numeric)	Two response options were created for ANC. 0-4, includes women who attended a maximum of 4 visits and less including those with no antenatal visits, while 5 + included women who attended a maximum of 5 visits and above	1.0-4 visits 2. 5+ visits
Place of Delivery	M15_1	10. Home, 11. Respondent's home, 12. Other home, 20. Public Sector, 21. Government hospital, 22. Government health center, 23. Government health post, 26. Other public sector, 30. Private Sector, 31. Private hospital/clinic, 32. Mission hospital/	Births delivered at health facilities including private and governmental hospitals were coded as 1. "Health Facility", births delivered at home, and other non-health facility places were recoded as 2. "Non-Health Facility"	1. Health Facility 2. Home and Other

		clinic, 36. Other private sector 96. Other		
Access to toilet facility	V116	10. Flush Toilet, 11. Flush to piped sewer system, 12. Flush to septic tank, 13. Flush to pit latrine, 14. Flush to somewhere else, 15. Flush, don't know where, 20. Pit toilet latrine, 21. Ventilated Improved Pit latrine (VIP), 22. Pit latrine with slab, 23. Pit latrine without slab/open pit, 30. Facility, 31. No facility/bush/field, 41. Composting toilet 42. Bucket, 43. Hanging toilet/latrine, 96. Other 97. Not a dejure resident	For this variable, two response options were created. The first response option combined all forms of toilets whether flushable or pit latrines, they included the following initial ZDHS coding options: Flush Toilet, Flush to piped sewer system, Flush to septic tank, Flush to pit latrine, Flush to somewhere else, Flush, don't know where, Pit toilet latrine, Ventilated Improved Pit latrine (VIP), Pit latrine with slab, Pit latrine without slab/open pit, Facility, Composting toilet The second response option newly coded as "No" included Bucket, No facility/bush/field	1.Yes 2. No
Source of Water	V113	10. Piped Water 11.Piped into dwelling 12. Piped to yard/plot 13. Piped to neighbor 14.Public tap/standpipe 20. Tube Well Water 21.Tube well or borehole	For this variable, only two response options were created that is Ground Water and Surface Water. Groundwater was defined as water that is found underground and surface water as water above the ground, including streams, rivers, lakes, wetlands, reservoirs, and creeks. Response option 1- Ground Water included Piped Water, piped into dwelling, piped to yard/plot, Piped to neighbor, Public	1. Ground Water 2. Surface Water and others

30.Dug Well (Open/Protected) 31. Protected well 32. Unprotected well 40. Surface from Spring 41. Protecting spring 42. Unprotected spring 43.River/dam/lake/ ponds/stream/canal /irrigation channel 51. Rainwater 52. Tanker truck 62. Cart with small tank 71. Bottled water 96. Other 97. Not a dejure resident	tap/standpipe, Tube Well Water, Tube well or borehole, Dug Well (Open/Protected), Protected well and Unprotected well. Response Option 2 - Surface Water and others included Surface water from Spring, Protecting spring, and Unprotected spring, River/dam/lake/ponds/stream/canal/irrigation channel, Rainwater, Tanker truck and Other. This categorization was informed by comparable reviewed studies on stillbirth and environmental factors such as the association between water source and stillbirth.

Bivariate Analysis

Bivariate analysis was used at this level to describe the relationship between categorical, nominal and ordinal variables and formed the foundation of the multivariate analysis. The Pearson's chi-square test (sometimes denoted as x^2) was used to indicate the statistical significance of the association between the dependent and each of the predictor variables. If the p-value was less than 0.05 (p 0.05), there was a statistically significant relationship between the predictor variable and dependent variable.

Multivariate Analysis

Binary logistic regression method was used to identify the factors associated with stillbirth outcome. The method allowed us to rank the relative significance of independent variables, assess interaction effects, and to understand the impact of covariate control variables (Lakew et al. , 2017). The odds ratio and its 95% CI were estimated and adopted for interpretation. The binary logistic regression equation was expressed as follows:

$$\text{logit}\left(\frac{P(event)}{1-P(event)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_k X_k.$$

Model Building

The model was built using the **Enter method**. In the first model, only the main independent variable (UP) and the outcome variable (stillbirth) were included. This helped us to determine the influence UP as a single variable on stillbirth.

In the second model, all the background and maternal health variables were entered in a single step to determine their influence on stillbirth. In the third model, UP was interacted with all the predictor variables to determine the effect of the interactions on stillbirth. The third model was necessary in order to compare the predicative ability of model two in comparison to model three. In this study, odds ratios were adopted for interpretation of the study results from the first to the final model. Model Three had a Hosmer and Lemeshow test chi-square value of 3.854 and p-value of 0.426 indicating that the model was a good fit compared to model two, which had chi-square value of 17.041, and significant p-value of 0.030.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Science (SPSS) version 23. The statistical analysis was done at three levels; Descriptive statistics which included frequencies and percentages, bivariate analysis and multivariate analysis. Binary logistic regression method was used to identify the factors associated with stillbirth outcome.

Ethical approval

The study was based on the 2018 ZDHS Data set. Authorisation to use the dataset was provided on the 7th February 2023 from the Demographic and Health Surveys (DHS) Program. All data was treated as confidential, and was not identified or linked to any household or individual respondent interviewed in the DHS survey. The authorization letter has been attached to this document.

STUDY FINDINGS

The study's findings have been presented in this chapter based on the Zambia Demographic Health Survey 2018 dataset.

Stillbirths by Women's Background and Maternal Health Characteristics.

Table 4.2 shows the distribution of stillbirths for women between the ages of 15 and 49 by background and Maternal Health characteristics of mothers.

Table 4.2: Percent Distribution of Stillbirths by Background Characteristics of the Mother

Variable	Frequency Weighted)	SBR Weighted)
Unintended Pregnancy (UP)		
No	4820	8.1
Yes	2950	4.4
Province of Residence		
Central	677	1.0
Copperbelt	870	1.5
Eastern	1050	1.3
Luapula	793	1.2

Lusaka	1141	2.2
Muchinga	494	0.4
Northern	752	1.3
North Western	419	1.3
Southern	1059	0.5
Western	513	1.9
Type of Residence		
Urban	2534	4.5
Rural	5235	8.0
Age		
15-24	1785	3.3
25-34	3832	6.3
35-49	2153	3.0
Maternal Education		
No education	909	0.8
Primary	4235	6.8
Secondary and higher	2626	5.0
Occupational Status		
Not working	3269	5.0
Unskilled Labour	768	1.8
Skilled Labour	3717	5.1
Marital Status		
Married	6494	2.7
Not Married	1275	9.8
Number of Children		
1-2 Children	1911	4.5
3-4 Children	2826	6.0
5+ Children	3033	1.9
Birth Interval		
8-12 Months	520	0.9
13-24 Months	1893	2.3

25+ Months	5356	9.4
Wealth Status		
Poor	3859	5.9
Middle	1461	1.4
Rich	2449	5.1
Total	**7769**	12.5

Stillbirth by Background Characteristics

Table 4.2 shows that the overall stillbirth rate (SBR) was 12.5 per 1000 births. Urban women had SBR of 4.5 per 1000 births while rural women had SBR of 8.0 per 1000 births. The SBR for women who intended to get pregnant was 8.1 per 1000 births, while the SBR for women who got pregnant unintentionally was 4.4 per 1000 births. The highest SBRs across all the background characteristics were recorded among women aged 25 to 34 (SBR=6.3 per 1000 births), women with only primary education (SBR=6.8 per 1000 births), women who were married (SBR=9.8 per 1000 births), women with a birth interval of 25 months or more (SBR=9.4 per 1000 births), and low-income women (SBR= 5.9 per 1000 births). Women who were in Muchinga province and women who were in Southern province had the lowest stillbirth rates of 0.4 and 0.5 per 1000 births respectively. Surprisingly, the SBR (0.9 per 1000 births) was also lower among women who had no education.

Table 4.2.2: Distribution of Stillbirths by Maternal Health Characteristics of the Mother

Variable	Frequency (Weighted)	SBR (Weighted)
Risk Behaviors During Pregnancy		
Smokes Cigarette		
No	7701	12.1

Yes	68	0.4
Intimate Partner Violence		
No	5522	7.2
Yes	2247	5.3
Health Care During Pregnancy		
Antenatal Care		
0-4 visits	5344	10.4
5+ visits	2425	2.1
Delivery Care factors		
Place of Delivery		
Health facility	6390	11.3
Home and others	1380	1.2
Water and Sanitation		
Access to a Facility		
Yes	6819	9.7
No	951	2.8
Source of Water		
Ground water	6726	11.6
Surface water and others	1044	0.9
Total	7769	12.5

Births by Maternal Health Characteristics

Table 4.2 shows that SBR among non-smokers was 12.1 per 1000 births. The SBR for women who experienced IPV was 5.3 per 1000 births. Women who attended less than four (4) antenatal care visits had SBR of 10.4 per 1000 births while women who delivered from health facilities had SBR of 11.3 per 1000 births. In addition, women who did not have access to toilet facilities during pregnancy had SBR of 2.8 per 1000 births while women who used surface water during pregnancy had SBR of 0.9 per 1000 births.

Correlations between Unintended Pregnancy and Stillbirth

To determine the strength of the relationship between stillbirth and UP, the Phi Coefficient was determined as explained in the methodology section. A Phi coefficient of -0.007 as shown in Table 4.3 signifies a weak negative association between UP and stillbirth.

Table 4.3: The Phi Coefficient Correlation between Unintended Pregnancy and stillbirth (Weighted)

	Stillbirth (Weighted)	
UP	No	Yes
	Weighted)	Weighted)
Unintended	2916	34
Intended	4756	63
Phi - - 0.007		
Approximate Significance 0.551*		
Total	7769	97

Bivariate Analysis

Bivariate Analysis of Stillbirths Distribution by Background Characteristics of Mother

Table 4.4.1 shows the results from the cross tabulation between background characteristics of mothers and stillbirth.

Among background characteristics, only Province of residence (Chi-Square Value 25.534 = P Value= 0.002) and number of children ever born (Chi-Square Value 23.194= P Value= 0.000) were significantly associated with stillbirth.

Table 4.4.1: Stillbirths Distribution by Background Characteristics of Mothers

Variable	Stillbirth (Weighted)		Pearson X^2	P-Value
	No	Yes		
UP			0.36	0.551
No	4756	63		
Yes	2916	34		
Province of Residence			25.534	0.002
Central	669	8		
Copperbelt	859	12		
Eastern	1041	10		
Luapula	784	9		
Lusaka	1124	17		
Muchinga	491	3		
Northern	743	10		
North Western	409	10		
Southern	1055	4		

Western	498	15		
Type of Residence				
Urban	2499	35	0.537	0.464
Rural	5173	62		
Maternal Age			1.200	0.549
15-24	1759	26		
25-34	3783	49		
35+	2130	23		
Maternal Education			3.698	0.157
No education	903	6		
Primary	4182	53		
Secondary and higher	2587	39		
Occupational Status			2.982	0.225
Not working	3230	39		
Unskilled Labour	755	14		
Skilled Labour	3677	40		
Marital Status			1.965	0.161
Not Married	1254	21		
Married	6418	76		
Number of Children			23.194	0.000
1-2 Children	1876	35		
3-4 Children	2779	47		
5+ Children	3018	15		
Birth Interval			1.937	0.380
8-12 Months	513	7		
13-24 Months	1875	18		
25+ Months	5284	73		
Wealth Index			5.952	0.051
Poor	3813	46		

Middle	1450	11
Rich	2409	40
Total	7672	97

Note: Low stillbirth numbers (3-25) may have an effect on the stability of the estimates for certain result

Bivariate Analysis of Maternal Health Characteristics by Stillbirth

To further establish the relationship between stillbirth and each of the predictor variables, a cross tabulation between maternal health characteristics and stillbirth was performed. Table 4.4.2 shows that access to toilet facility (Chi-Square Value = 9.969: P Value= 0.002), cigarette smoking (Chi-Square Value = 5.567: P Value= 0.018), intimate partner violence (Chi-Square Value = 8.510: P Value= 0.004), antenatal care (Chi-Square Value = 9.922: P Value= 0.002) and place of delivery (Chi-Square Value = 9.922: P Value= 0.002) were all significantly associated with stillbirth.

Table 4.4.2: Stillbirths Distribution by Maternal Health Characteristics

Variable	Stillbirth (Weighted)		Pearson X^2	P-Value
	No	Yes		
Smokes Cigarette			5.567	0.018
No	7607	94		
Yes	65	3		
Intimate Partner Violence			8.510	0.004
No	5466	56		
Yes	2206	41		
Health Care During Pregnancy				
Antenatal Care			9.922	0.002
0-4 visits	5263	81		
5+ visits	2410	16		
Delivery Care factors				
Place of Delivery			4.829	0.028

Health facility	6302	88		
Home and others	1370	9		
Water and Sanitation				
Access to a Toilet Facility			9.969	0.002
Yes	6744	75		
No	929	22		
Source of Water			3.258	0.071
Ground water	6636	90		
Surface water and others	1036	7		
Total	7672	97		

Note: Low stillbirth numbers (3-25) may have an effect on the stability of the estimates for certain results

Model Building

Effect of Unintended Pregnancy on Stillbirth (Model I).

This section focused on determining the influence of UP on stillbirth as a single variable, holding all other factors constant. The results in Table 4.5.1 show a non-significant association between UP and stillbirth.

Table 4.5.1: Unadjusted Odds Ratios on the Influence of Unintended Pregnancy on Stillbirth

Variable	Odds Ratio	P-Value	95% CI
UP			
Yes	RC (1.0)		
No	0.868	0.510	[0.570-1.322]
Total	7769		

Multivariate Analysis

Model Two

The conceptual framework was followed in the development of this model. The model was built using binary logistic regression (enter method) to assess the influence of all the background characteristics on stillbirth and all the maternal health characteristics broken down by risk behaviours during pregnancy, health care during pregnancy, delivery care and water and sanitation factors. Table 4.6.1 below shows the adjusted odd ratios from the binary logistic regression model of the individual predictor variables on stillbirt

Table 4.6.1 Influence of Background and Maternal Health Characteristics on Stillbirth

Variable	AOR	P-Value	95% CI
MAIN INDEPENDENT VARIABLE			
UP			
No	RC (1.0)		
Yes	0.848	0.480	[0.537-1.339]
BACKGROUND CHARACTERISTICS			
Province of Residence			
Central	RC (1.0)		
Copperbelt(1)	0.806	0.666	[0.303-2.142]
Eastern(2)	0.364	0.079	[0.117-1.126]
Luapula(3)	1.088	0.871	[0.395-2.993]
Lusaka(4)	0.806	0.649	[0.318-2.044]
Muchinga(5)	0.635	0.512	[0.163-2.473]
Northern (6)	1.529	0.405	[0.563-4.156]
North Western(7)	2.137	0.122	[0.816-5.592]
Southern(8)	0.252	0.033	[0.071-0.893]
Western(9)	1.579	0.362	[0.591-4.215]
Residence			
Urban	RC (1.0)		
Rural (1)	1.739	0.128	[0.852-3.548]
Age			
15-24	RC (1.00)		

25-34 (1)	1.346	.316	[0.753-2.407]
35-49 (2)	2.765	.010	[1.271-6.016]
Maternal Education			
Secondary and Higher	RC (1.0)		
No Education (1)	0.740	.537	[0.285-1.923]
Primary (2)	1.176	.523	[0.715-1.934]
Occupational Status			
Skilled Labour	RC (1.0)		
Not Working	1.222	.397	[0.768-1.947]
Unskilled Labour	1.843	.061	[0.972-3.496]
Marital Status			
Married	RC (1.0)		
Not Married	1.247	0.409	[0.738-2.104]
Number of Children Ever Born			
1-2 children	RC (1.0)		
3-4 children (1)	0.823	0.462	[0.489-1.384]
5 + children (2)	0.172	0.000	[0.076-0.387]
Birth Interval			
25+ months	RC (1.0)		
8-12 months (1)	0.927	.854	[0.412-2.086]
13-24 months (2)	0.755	.307	[0.440-1.295]
Wealth Index			
Rich	RC (1.0)		

Poor (1)	.449	.050	[0.202-1.000]
Middle (2)	.410	.033	[0.180-0.932]
MATERNAL HEALTH CHRACTERISTICS			
Risk Behaviors During Pregnancy			
Smokes Cigarette			
No	RC (1.0)		
Yes (1)	2.314	0.211	[0.622-8.600]
Partner Violence			
No	RC (1.0)		
Yes (1)	2.041	0.001	[1.304-3.387]
Health Care During Pregnancy			
Antenatal Care			
5+ visits	RC (1.0)		
0-4 visits (1)	2.390	0.002	[1.373-4.159]
Delivery Care factors			
Place of Delivery			
Health facility	RC (1.0)		
Home and others (1)	0.466	0.038	[0.226-0.960]
Water and Sanitation			
Access to a Toilet Facility			
Yes	RC (1.0)		
No (1)	2.431	0.014	[1.199-4.931]
Source of Water			
Ground Water	RC (1.0)		

Surface Water and other sources (1)	0.628	0.263	[0.278-1.418]
Intercept	0.007	0.000	

*Sig. at *P<0.05 Odds Ratios, CI-Confidence Interval, and RC-Reference Category: Calculated Using the 2018 ZDHS Data Set*

The Influence of background characteristics on stillbirth

Holding all other factors constant, Table 4.6.1 reveals that pregnant women in the southern province had a 74.8% lower risk of stillbirth than those in the central province (AOR=0.252, 95% CI: 0.071, 0.893). The analysis reveals that women aged 35-49 are nearly 2.8 times more likely to experience a stillbirth compared to those aged 15-24 (AOR = 2.765, 95% CI: 1.271, 6.016). This indicates that maternal age is a significant factor, with older women facing a higher risk of stillbirth. The confidence interval further supports this finding, confirming that the increased risk associated with older age is statistically significant.In addition, women who had 5 or more children were 82.8%, less likely to have a stillbirth in relation to those who had 1 or 2 children (AOR= 0.172, 95% CI: 0.076, 0.387). Furthermore, women in the middle income category were 59% less likely to have a stillbirth (AOR=0.410, 95% CI: 0.180, 0.932). Background variables such as UP, residence type, maternal age, maternal education, marital status, occupation status and birth interval, did not show any significant influence on stillbirth.

The influence of Maternal Health Characteristics on Stillbirth

Table 4.6.1 shows a significant association between IPV and stillbirth as women who experienced IPV were 2.0 times more likely have a stillbirth than their counterparts who were not affected by IPV (AOR=2.041, 95% CI: 1.304, 3.387), holding all other factors constant. The risk of having a stillbirth was also statistically significant among women who attended fewer antenatal care visits. Women who attended four (4) or fewer antenatal visits were 2.6 times more likely to have a stillbirth compared to their counterparts who attended five (5) or more (AOR=2.640, 95% CI:1.430, 4.874), holding all other factors constant. Furthermore, not having a toilet facility during pregnancy was significantly associated with an elevated risk of stillbirth (AOR=2.431, 95% CI: 1.199, 4.931), holding all other factors constant. On the contrary, results show that women who delivered from home and other non-health facility places (AOR=0.466, 95% CI: 0.226, 0.960), were significantly less likely to have a stillbirth than those who delivered from health facilities, holding all other factors constant.

Model Three (Interactions)

In this model, UP as a single variable and the interactions between UP and all the background and maternal health variables were entered in a single step to determine their influence on stillbirth. The interaction enabled us to examine whether the association between UP and Stillbirth depended on the value of selected background and maternal health variables. This was the best model in determining the overall effect of UP on stillbirth as well as the effect of selected background and maternal characteristics on stillbirth.

Table 4.6.3: Influence of Background and Maternal Health Characteristics on Stillbirth

Variable	AOR	P-Value	95% CI
MAIN INDEPENDENT VARIABLE			
UP			
No	RC (1.0)		
Yes	0.072	0.037	[0.006-0.849]
BACKGROUND CHARACTERISTICS			
UP *Province of Residence			
Central	RC (1.0)		
Copperbelt(1)	0.000	0.993	
Eastern(2)	0.228	0.112	[0.037-1.414]
Luapula(3)	0.390	0.307	[0.064-2.376]
Lusaka(4)	0.267	0.111	[0.053-1.353]
Muchinga(5)	0.117	0.167	[0.006-2.461]
Northern (6)	0.000	0.995	
North Western(7)	2.338	0.236	[0.574-9.520]
Southern(8)	0.239	0.138	[0.036-1.586]
Western(9)	1.232	0.790	[0.265-5.730]
UP *Residence			
Urban	RC (1.0)		
Rural (1)	1.103	0.888	[0.280-4.340]
UP *Age			
15-24	RC (1.00)		
25-34 (1)	1.052	0.926	[0.364-3.039]
35-49 (2)	2.431	0.273	[0.497-11.893]
UP *Maternal Education			
Secondary and Higher	RC (1.0)		
No Education (1)	0.099	0.189	[0.003-3.128]
Primary (2)	1.926	0.193	[0.718-5.168]
UP *Occupational Status			

Skilled Labour	RC (1.0)		
Not Working	2.949	0.027	[1.133-7.678]
Unskilled Labour	1.586	0.601	[0.282-8.928]
UP *Marital Status			
Married	RC (1.0)		
Not Married	2.355	0.55	[0.980-5.659]
UP *Number of Children Ever Born			
1-2 children	RC (1.0)		
3-4 children (1)	1.191	0.756	[0.395-3.595]
5 + children (2)	0.285	0.135	[0.055-1.476]
UP *Birth Interval			
25+ months	RC (1.0)		
8-12 months (1)	0.000	0.994	
13-24 months (2)	1.288	0.553	[0.558-2.973]
UP *Wealth Index			
Rich	RC (1.0)		
Poor (1)	0.588	0.488	[0.131-2.640]
Middle (2)	0.745	0.684	[0.180-3.080]
MATERNAL HEALTH CHRACTERISTICS			
Up* Smokes Cigarette			
No	RC (1.0)		
Yes (1)	38.851	0.004	[3.166-476.714]
Up* Partner Violence			
No	RC (1.0)		
Yes (1)	2.852	0.018	[1.200-6.779]
Up* Antenatal Care			
5+ visits	RC (1.0)		
0-4 visits (1)	7.718	0.020	[1.387-42.930]

Place of Delivery			
Health facility	RC (1.0)		
Home and others (1)	0.865	0.769	[0.330-2.270]
UP* Access to a Toilet Facility			
Yes	RC (1.0)		
No (1)	1.879	0.291	[0.583-6.055]
Source of Water			
Ground Water	RC (1.0)		
Surface Water and other sources (1)	1.113	0.902	[0.203-6.093]
Intercept	0.013	0.000	

*Sig. at *P<0.05 Odds Ratios, CI-Confidence Interval, and RC-Reference Category: Calculated Using the 2018 ZDHS Data Set*

The third and final model results show that UP was significantly less likely to influence stillbirth. The results in Table 4.6.3 show that women who had UP were 92.8% less likely to have a stillbirth in relation to women who had intended pregnancies (AOR=0.072, 95% CI: 0.006, 0.849), holding all other factors constant. The interactions between UP and occupation status significantly influenced stillbirth by 1.13 times (AOR=2.949, 95% CI: 1.133, 7.678). Additionally, the interaction between UP and cigarette smoking significantly influenced stillbirth by 38.9 times (AOR=38.851, 95% CI: 3.166, 476.714). The interaction between UP and IPV had a significant effect on stillbirth (AOR=2.852, 95% CI: 1.200, 6.779). Furthermore, the interaction between UP and antenatal care significantly influenced the odds of having a stillbirth by 7.7 times (AOR= 7.718, 95% CI: 1.387, 42.930). However, the interactions between UP and variables such as province of residence, residence type, number of children ever born, maternal age, maternal education, marital status, birth interval, place of delivery and source of drinking water did not show any significant influence on stillbirth.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

The study findings discussed in this chapter have been organised according to the study objectives. The association between UP and stillbirth as expressed in the first objective was determined using Model Three. The study findings showed that UP was significantly less likely to influence stillbirth. The study findings further revealed that the majority of the stillbirth (102) were found to be among women who had intended pregnancies than those who had UP (49). The finding is in agreement with a study that investigated the prevalence, determinants and outcome of women with UP in Zambia, which found that unintended pregnancy was less likely to influence stillbirth (Mutumbi, 2013). The possible explanation for these findings is that Zambia has achieved progress over the years in lowering both stillbirth and UP rates. Evidence shows that the percentage of unwanted pregnancies has declined from 20.4% in 2002 to 5.5% in 2018 and the stillbirth rate (SBR) has declined by 14% between 2007 and 2018 (USAID, 2023).

To the contrary, studies conducted within Sub Saharan countries with similar socioeconomic

conditions as Zambia have varying results. Studies conducted in Malawi (Hall et al., 2018) and Ethiopia (Liga , 2020) revealed a significant association between unintended pregnancy and stillbirth while a demographic study conducted in Kenya by the Population Council found no significant relationship between UP and birth outcomes including stillbirth (Obare et al., 2012).

The multivariate binary logistic regression was utilised to address the second objective, which sought to investigate the effect of the interactions between UP and background characteristics on stillbirth. The background characteristics included province of residence, type of residence, maternal age, maternal education, wealth index, occupational status, marital status, family size and birth spacing. Of all the background characteristics, only occupation status (non-working category) had significant association with stillbirth. One possible explanation is that pregnant women who do not work may have elevated levels of stress hormones and insufficient financial resources, which may ultimately result in behaviors that could compromise their health (Sumner R et al., 2017; De Cao etal, 2022).

Additionally, the availability of high-quality obstetric services may vary depending on the employment situation of the mother. Pregnant women without a job may not be able to afford high quality medical care, which could elevate the risk of stillbirth. The study finding is in agreement with a national population-based study in South Korea, which found that the risk of stillbirths was higher in non-employed women than in employed women (Kim et al, 2023). Another study that investigated the factors related to the stillbirth rate in the Yazd province, Iran, found a significant association between occupational status and stillbirth (Mohammad T. M, et al, 2024).

Furthermore, Sarah, (2020) argues that unemployed women are nearly three times more likely to suffer stillbirth than affluent women. This is mostly due to high levels of maternal stress which in turn doubles the risk of stillbirth. However, there is also limited literature on the association between occupation status and stillbirth, as well as the interaction effect of UP and occupation status on stillbirth, particularly in Sub-Saharan Africa. This gap in the literature underscores the need for further research to explore the interactions between UP and various sociodemographic and health-related factors in influencing maternal and fetal health outcomes.

The maternal health factors considered in this study include intimate partner violence, smoking cigarettes, antenatal care visits, place of delivery, and access to toilet facility and source of drinking water.

The interaction between UP and intimate partner violence significantly influenced the risk of stillbirth. This is so perhaps because women who experience intimate partner violence may experience stress, which may affect their ability to access antenatal care services, and the physical harm suffered can result in placental abruption, which can cause haemorrhage, early birth, and fetal distress (Sristy et al., 2023). It is also argued that women who experience sexual violence may also be exposed to HIV and sexually transmitted diseases that can influence pregnancy outcome (Gebreslasie et al., 2020). A systematic review demographic studies in SSA countries of Angola, Chad, Congo DR, Gabon, Benin, Burkina Faso, Cote D'lvoire, Gambia, Mali, Comoros, Rwanda, Uganda, Malawi and Zambia inclusive found that intimate partner violence plays a key role in fetal death through miscarriages, stillbirths or induced abortions (Ahinkorah, 2021).

Results of the study further showed that the interaction between UP and attending 4 or less antenatal care visits had a significant influence on stillbirth. This is so perhaps because women with unintended pregnancies may practice unhealthy behaviours during pregnancy such as poor utilisation of antenatal care services which may affect the quality of care during pregnancy and childbirth and ultimately lead to stillbirth. It is also argued that a higher frequency of antenatal contacts by women with a health provider is associated with a reduced

likelihood of stillbirths. This can be attributed to the greater possibilities for identifying and handling complications during pregnancy (WHO, 2016). The study results further revealed that 71.5% of women who attended less than four (4) antenatal care visits also had unintended pregnancies. This is a clear indication that the quality of maternal care for these pregnancies could have been compromised. A study on the on the association between utilisation and quality of antenatal care with stillbirths in Kenya agrees with these findings as they found that attending fewer than four antenatal visits is significantly associated with stillbirth (Gwako, G.N, 2020). This is similar to the systematic review on the effects of antenatal interventions for preventing stillbirth for low risk women which found that pregnant women, who start antenatal care early have reduced odds of experiencing stillbirth (Ota E et al. , 2020). To the contrary, a case control study that looked at the determinants of stillbirth in Zambia did not find a statistical association between early initation of antenatal care and stillbirth (Makasa, M et al. , 2023). Investment in initiatives targeted at increasing the use of antenatal care services by women who become pregnant unintentionally is therefore necessary to lower the incidence of stillbirth in Zambia.

The interaction between smoking cigarettes and unintended pregnancy was also found to significantly influence of stillbirth among women in the reproductive age group. This finding is consistent with the findings of a systematic review by Marufu, T.C. et al., (2015) on maternal smoking and the risk of stillbirth focusing on both developed and developing countries, which showed that women who smoke during pregnancy have an increased risk of stillbirth. This could be explained by the low awareness levels on the negative effects of cigarette smoking on the unborn child. According to the International Tobacco Control survey of 2015, Zambia is one of the countries with the lowest level of awareness of the risk of smoking. Cultural norms in certain communities may also normalize smoking, further complicating efforts to reduce maternal smoking rates The policy brief for Tobacco Control as an Accelerator for the Sustainable Development Goals indicates that most Zambian women do not think tobacco use during pregnancy is harmful to their baby (ITC, 2014). Addressing these cultural and socioeconomic barriers is critical for reducing smoking during pregnancy, particularly for women with unintended pregnancies, and for improving maternal and fetal health outcomes in Zambia.

Additionally, studies have shown that smokers from lower socioeconomic groups are less likely to be successful in stopping smoking than wealth smokers, even after accessing cessation programs (Linke et al., 2015). Furthermore, low income has been identified as a significant barrier to smoking cessation, with women of lower socioeconomic status reporting financial stress as a prevalent reason for having difficulty quitting (Morrell et al., 2017).

There is also evidence from literature suggesting that women with UP are more likely to follow unhealthy behaviours such as smoking and alcohol consumption before and during pregnancy, which may result in a stillbirth (Yu P et al. , 2022). This supports the findings of the current study because all of the stillbirths among cigarette smokers were among women with unintended pregnancies. This may help explain why the interaction between UP and smoking cigarettes increased the risk of stillbirth.

CONCLUSION

The study found that unintended pregnancy (UP) has no direct effect on stillbirth. The odds of stillbirth are lower among women with UP. The study also found that background and maternal health characteristics, such as occupational status, intimate partner violence, lack of toilet facilities, and smoking cigarettes, significantly influence stillbirth.

RECOMMENDATIONS

The following recommendations are made in light of the study's findings:

1) The Ministry of Health and other stakeholders should recognise the role of UP in perpetuating intimate partner violence (IPV) and implement strategies such as screening women for past experiences, and target offenders through awareness programs for improved maternal health outcomes.
2) The study highlights the significant impact of cigarette smoking on stillbirth, highlighting the need for advocacy campaigns and training for health professionals and psychosocial counsellors to educate pregnant women on the effects of smoking and support them in quitting smoking.
3) There is a need to improve antenatal care (ANC) services for women with unintended pregnancies (UP), particularly by addressing barriers such as accessibility and affordability. This can be achieved by increasing awareness, conducting community outreach, and offering subsidized healthcare for vulnerable groups to improve ANC utilization among women with UP.
4) Given the significant association between occupational status (non-working category) and stillbirth in this study, it is crucial to develop targeted interventions for unemployed pregnant women, including financial support and subsidies for healthcare. Expanding access to quality maternal care and mental health programs will help alleviate stress and improve pregnancy outcomes. Collaboration with NGOs and community organizations is essential to enhance outreach and ensure that these vulnerable women receive the necessary support and services.

5) To gain a deeper understanding of the factors contributing to regional variations in stillbirth rates, future research should incorporate qualitative follow-up studies. These studies could explore cultural factors, healthcare barriers, and regional disparities in access to maternal care, providing essential context to the quantitative findings. Such research will enable more targeted interventions and policy recommendations to address the unique challenges faced by women with UP in different provinces.

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