Three Delays Model in the Context of Maternal Mortality in Longido District, Tanzania

*Delphina M. Joseph
ORCiD: https://orcid.org/0000-0001-5253-8265
Department of Sociology, The Open University of Tanzania
Email: delphinemselle@gmail.com

Prof. Hosea Rwegoshora, PhD
ORCiD: https://orcid.org/0009-0005-4822-3283
Department of Sociology, The Open University of Tanzania
Email: hosearwego@gmail.com

Harrieth Mtae, PhD
ORCiD: https://orcid.org/0000-0002-6059-378X
Department of Economics and Community Economic Development, The Open University of Tanzania
Email: mtaeharrieth14@gmail.com

*Corresponding Author: delphinemselle@gmail.com

Abstract: This study dealt with the three delays model in the context of maternal mortality in Longido District, Tanzania, using the descriptive correlational design. The study selected the district due to the highest maternal mortality rates and number of women giving birth to traditional birth attendants compared to other districts in Arusha. A sample of 311 respondents from 14 health facilities participated by filling out a questionnaire. Data analysis took place through descriptive statistics and regression analysis. Based on the findings, the study concluded that although respondents possessed essential knowledge to prevent maternal mortality, they also possessed negative opinions that could delay their actions against the maternal mortality. While women's readiness to reach the healthcare facilities prevailed, male partners' willingness to escort their wives to the healthcare facilities did not exist. Therefore, male-female partnerships in reaching healthcare support emerged as a challenge. Furthermore, the care received from medical facilities sounds unsatisfactory due to limited medical personnel, facilities, and equipment. Social cultural practices predicted the maternal mortality. Therefore, strengthening community awareness, addressing socio-cultural barriers and positivity in accessing services will alleviate delays and reduce maternal mortality. Enhancing family and spousal support towards decision-making and financial support will overcome barriers to care, improve maternal health and reduce the maternal mortality. Strengthening the health system by sustaining resources, accountability, and improved working environment are essential steps towards enhancing the quality of care and consequently reducing maternal mortality.

Keywords: Three Delays model; maternal mortality; socio-cultural practices.

Introduction

This study tested the Three-Delays Model (3Ds), the model that was established by Thaddeus and Maine in 1994 to explain the interconnections of the sources of maternal health problems and provide corresponding problem-solving responses through multiple actions. The model helps in identifying health service factors contributing to maternal death (Thaddeus & Maine, 1994). The 3Ds model comprises the delay in deciding to seek appropriate

care, delay in accessing the appropriate source of care and delay in receiving adequate care (Arif *et al*., 2022; Illias et al., 2018; Sara e*t al*., 2019; Ogu, 2023; Usman et al., 2018). Maternal mortality is linked to poverty, distances to health facilities, lack of information, poor care, cultural beliefs and traditional practices, leading to complications like haemorrhage, eclampsia and infections(Ali & Ahmed, 2024).

Trends of Maternal Mortality Ratio (MMR) in the world were reported to decline by 34.3% from 2000 to 2020 while increasing in most countries (WHO *et al*., 2023). Tanzania's Maternal Mortality Ratio has significantly changed from 556 deaths over 100,000 (Tanzania Demographic and Health Survey and Malaria Indicator Survey (2016) to 104 in 2022 (Tanzania Demographic and Health Survey and Malaria Indicator Survey (2023). However, maternal mortality rate increased in Arusha Region from 101 in 2012 to 127 in 2017 while Longido and Ngorongoro had the highest rates of 184 and 266 deaths over 100,000 live births, respectively in 2017(Maternal Newborn and Child Health, 2012-2017). Despite national policies of free maternal health services, the persistence of maternal mortality may be due to delays from different levels following inadequate community awareness, cultural malpractices, gender inequality, poor health-seeking behaviours and inadequate health systems. Therefore, this study sought to link the problem of maternal mortality with the *three-Delay Model*. The objective of the study was to establish how the *three delays* affect maternal mortality. Specifically, the study sought to find out the influence of delays in decision-making (D1), delays in accessing care (D2) and delays in receiving care (3Ds) on maternal mortality as shown in figure 1.
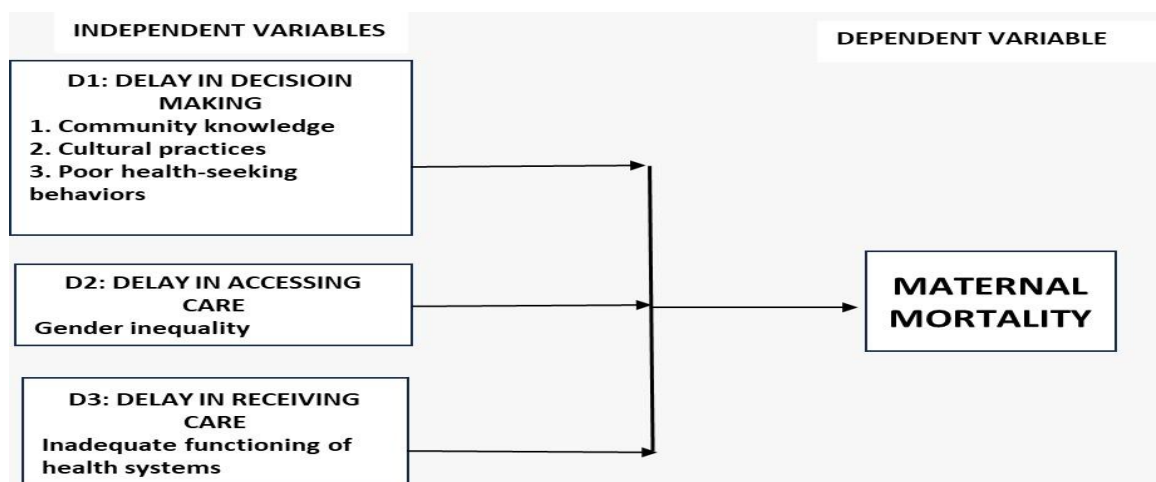

Figure 1: A model showing the applicability of the 3-Delays on Maternal Mortality

Literature Review

Maternal Mortality is considered a social, economic and health problem (Jabessa & Jabessa, 2021; Matovelo *et al*., 2021; Ogu, 2023). It is referred to as the death of a woman while pregnant or within 42 days after pregnancy for any reason not related to accidental or incidental causes (WHO et al., 2023). The most documented reasons for high maternal mortality refer to the technical and political bottlenecks linked to social, cultural and economic circumstances associated with delays in decision-making, delays in accessing services and delays in receiving care (Friday et al., 2021; Kurjak et al., 2023).

This study identified some indicators of community awareness leading to poor decision-making in accessing of services. The study identified the knowledge, health seeking behaviours and traditional practices as indicators of maternal mortality in Longido District. These factors relate to type one delays (Table 1) Studies have indicated delays in decision-making as majorly affected by the levels of education and past experiences (Asfaha, 2022; Asogwa *et al*., 2022; Mahyul *et al*., 2024).

Gender challenges, inadequate women's rights to education, lack of proper information, lack of reproductive choices and early marriages are believed to contribute to maternal mortality. Other factors include early pregnancies, limited choices, lack of decision on health, low utilization of health services, low income, unsafe abortions and sexual discrimination (Wallace et *al*.,2022; Hekmatpour, 2021;Boniphace *et al*., 2021b; Mahyul *et al*., 2024).

Cultural norms, taboos and traditional practices contribute to maternal mortality in most of countries in the world (Ajayi *et al*., 2023; Botchwey *et al*., 2022; Felisian *et al*., 2023; Jakperik *et al*., 2023; Larbi, *et al*., 2021; Ogu, 2023; Masaba & Mmusi 2023; Ndiaye *et al*., 2022; Padmanaban, 2019; Poikolainen, 2022; Santos *et al*., 2022). In Tanzania for instance, challenges in education include the stigma of male participation in pregnancy care (Boniphace *et al*., 2022), knowledge of contraceptives (Mbuya *et al*., 2022), education inequities and health service utilization (Kinyondo *et al*., 2022). They also include gender inequality and social-cultural barriers (Boniphace et al., 2021a; Felisian et al., 2023; Ndiaye *et al*., 2022;Peterson *et al*.(2022) and Webber *et al*., 2022) were found to contribute to Maternal Mortality. Most of these challenges affect delays in decision-making and delays in reaching health facilities, leading to complications and maternal mortality.

The Concept of the Three-Delay Model
The three Delays Model (3Ds) explains three levels of problems where solutions should focus on multiple actions. Thaddeus and Maine in 1994 established this model as a framework to explain causal relationships of maternal mortality. The model indicates barriers faced by women in need of maternal health from accessing care (Ogu, 2023). Studies indicate some contributions of the model to maternal mortality by identifying delays in decision-making, delays in accessing to care and delays in receiving care (Arif et al., 2022; Ogu, 2023; Sara et al., 2019; Santos et al., 2022; Osaki et al., 2024). This study tested the Three Delays model by examining socio-cultural variables and health system failures causing maternal mortality. Community knowledge and cultural practices, gender inequality, poor health-seeking behaviours and health system failures are proximal to the three delays model.

Delay in Decision-Making
Type one Delays (1stDs) is associated with the delays in decision-making at the individual, community or peers' level. Women's decisions are mostly influenced by previous experiences on childbearing, literacy, traditions, household income, gender inequality, religion and cultural beliefs that create barriers to the accessibility of health care(Ogu, 2023; Tun *et al*., 2023).

A study in Nyanmar found the first Delays as a major delay, leading to eclampsia/Pre-eclampsia, Post-Partum Haemorrhage and abortion related complications (Tun, *et al*., 2023). In this study, the delay in decision-making was studied proxy to the community knowledge and cultural practices.

Delay in Reaching Care
Delay in reaching care considers the time taken from home to a health facility for services. This is highly contributed by inadequate income, distance from home to facilities and lack of transport (George *et al*., 2022; Serbanescu et al., 2022; Felisian et al., 2023; Yang & Yu 2023; Ogu, 2023 ;Mahyul et al., 2024). A study in Kigoma, Tanzania indicated some initiatives in improving services by introducing Emergency Obstetric Neonatal Care (EMONC). However, lack of transport hindered accessibility to services as intended (Prasad *et al*., 2022). Nigeria found various delays leading to maternal mortality, but the most prominent delays were delays in reaching health facilities and delay in receiving care (Piane *&* Azubuike, 2023).

Delay in Receiving Care
The Delay in receiving care occurs at the health facility when women are kept in waiting for services. The most documented reasons for such delays were related to the health system failure, including inappropriate care, lack of preparedness, skills gap among service providers, attitudes of providers, infrastructures, inadequate medical supplies and commodities and lack of reliable transport in case of referrals (Arif *et al*., 2022; Bibi *et al*., 2023; Masaba & Mmusi-Phetoe, 2023; *et al*., 2024; Ogu, 2023; Poppens *et al*., 2023; Patil *at al*.,2020; Piane & Azubuike, 2023; Rebeiz *et al*., 2023). Poor accessibility and affordability of health services are reported to fuel the increase in maternal mortalities (Kinyondo et al., 2022). The third type of delays also indicates the referrals (from one facility to another) as the major indicator of maternal death that resulted from severe complications like eclampsia, prolonged labour, retained placenta and severe bleeding (Arif *et al*., 2022;Usman et al., 2018; Gunawardena *et al*.,2018; Straneo, 2024; Weeks, 2024).

Methodology
Design
A study used the descriptive correlational design. Through the descriptive aspect, the results show the perception of respondents. Through regression analysis, the study tested the existing relationship between the variables.

Population and Sampling

The study took place in Longido District, Arusha Region. The study purposively selected Longido out of seven districts in Arusha since it has the highest maternal mortality rates and number of women giving birth to traditional birth attendants (District Health Information Systems (2017-2023). The district had 18 wards that had 37,540 women of reproductive age (DHIS 2019). From the 18 wards, the study selected 14(78%) wards. The sample of 311 respondents participated by filling the questionnaire.

Validity and Reliability

The questionnaire was pretested to 30 students from a selected university in Arusha region to test the validity and reliability. The use of triangulation methods of data collection increased the reliability of the findings.

Ethical Considerations

The Open University of Tanzania provided a research clearance, approved by the Research department. Furthermore, the study got an approval from the Regional and Council Administrative Authorities and respective health facilities. The researcher ensured respondents' voluntarism and anonymity in the field.

Results and Discussions

The section presents the results showing the applicability of three delays in maternal mortality by looking at the knowledge/community awareness, practices and capacities of health facilities in attending pregnant women and delivery services. Descriptive results appear in table 1-3 while correlational results appear in table 4-6.

Delays in Decision-making

In table 1, respondents rated selected factors believed to affect decision-making against the maternal mortality. The first four statements were positively stated and respondents agreed with such statements. For instance, they agreed that maternal mortality occurs due to avoidable reasons (4.11), that health facilities require a priority than traditional means (4.07), that it is important to deliver at health facility settings (4.06) and that childbearing at home can open avenues to maternal mortality (4.06). These findings reveal that community members possessed some knowledge of preventable delaying factors that can cause maternal mortality.

Table 1: Delays in Decision-making

SN	Variables	Mean	Std. Dev	Interpretations
1	Maternal mortality occurs for reasons that can be avoidable	4.11	.744	Agree
2	Health facilities require a priority over traditional alternatives	4.07	.748	Agree
3	It is important for a woman to deliver at health facility settings	4.06	.795	Agree
4	Childbearing at home can cause maternal mortality	4.06	.772	Agree
5	It is important to consult a religious leader than seek medical care	4.09	.748	Agree
6	Superstitions /witchcraft contributes to Maternal mortality	3.54	.620	Agree
7	Herbal concoctions can be used before visiting Health Facilities	4.03	.709	Agree

Table 2: Delays in Reaching Health Facilities for Care

SN	Variables	Mean	Std. Deviation	Interpretations
1	I attend health care facility with my spouse	1.48	.704	Disagree
2	There is financial support to reach the health facility	3.75	1.316	Agree
3	Reliable transport to health care during pregnancy	3.66	1.322	Agree

While the last three statements in table 1 appear in a negative form, respondents agreed with such statements. For instance, they agreed on the necessity to consult religious leaders before seeking medical care (4.09). They also contended that maternal mortality results from superstitions or witchcraft (3.54) and that people could use herbal concoctions before visiting health facilities (4.03). Therefore, although respondents possessed essential knowledge of the preventability of maternal mortality, they also possessed negative opinions that could delay their actions against maternal mortality. Such negative predicaments include dependence on religious leaders' help over the medical facility support, considering maternal mortality resulting from superstitions or witchcraft and readiness to use traditional concoctions before consulting medical experts.

These findings match with previous study findings by Tun *et al*. (2023) in which respondents possessed negative views pertaining to decision-making dimensions that caused haemorrhage and abortion-related complications.

Delays in Reaching Health Facilities

The researchers subjected the respondents to three items related to reaching health facilities during pregnancy. Results in table 2 reveal that women did not attend healthcare facilities with their spouses (1.48) even though the families provided financial support towards the course (3.75). Furthermore, the families had reliable transport to healthcare facilities during pregnancy time.

Therefore, inadequate male-female partnership in accessing health facilities emerged as a serious challenge leading to delays in receiving care

(Gurara ,2024;Tumwizere et al., 2024). Husbands' and wives' attendance at the clinics indicates awareness of the collaborative approach in caring for pregnant women, and enhanced birth preparedness (Foglabenchi et al., 2024; Heri et al., 2024;Asti Ratnaningrum, 2024).

Delays in Receiving Care

In table 3, the study had six items in the questionnaire that measured the delay in receiving care. This factor was solely on the health facility's part. In response, respondents disagreed with all the six items. They perceived insufficient healthcare support (2.38), limited supplies and equipment (2.47), delayed service (2.56), inadequate transport during referral cases (2.50), limited service for 24 hours (2.27) and limited staff house within the health care facilities (2.16).

Table 3: Delay in Receiving Care

SN	Variables	Mean	Std. Dev	Interpretations
1	The number of staff is sufficient compared to the need	2.38	.485	Disagree
2	There is sufficient supplies and equipment	2.47	.500	Disagree
3	Facilities provide quickly service	2.56	.497	Disagree
4	There is adequate transport in case of referrals	2.50	.501	Disagree
5	Services are provided in 24 hours	2.27	.562	Disagree
6	There are staff houses within the facility	2.16	.365	Disagree

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.422[a]	.178	.175	.45623

a. Predictors: (Constant), Social-cultural Practices

Table 5: ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.789	1	13.789	66.248	.000[b]
	Residual	63.691	306	.208		
	Total	77.480	307			

a. Dependent Variable: Mortality

a. Predictors: (Constant), Social-cultural practice

This finding suggests that respondents rated the care received as unsatisfactory. Literature shows that a shortage of skilled personnel like doctors, nurses and midwives prevents sustainable access to care and the provision of quality services. These shortcomings may lead to maternal mortality (Paul & Pradeep, 2024; Samuel, 2024; Ngowi *et al*., 2024; Paul & Pradeep, 2024). These findings indicate the necessity to strengthen provision of personnel and required facilities and equipment to avoid potential delays in receiving health care support.

Socio-cultural factors and Maternal Mortality

This section sought to establish the relationship between social-cultural factors as an independent variable (social-cultural practices, awareness, gender equality and capacities of health facilities) and maternal mortality.

Results appear in table 4-6. This initiative called for the following research question: To what extent do social-cultural factors affect maternal mortality in Longido District? The research question called for testing of the following null hypothesis through

linear regression: there is no significant effect of social-cultural practices on maternal mortality in Longido District. The hypothesis testing took place through regression analysis, as it appears in table 4, 5 and 6.

In Table 4, the results show that only social-cultural practices appear to be contributing toward maternal mortality in Longido District. The multiple correlation coefficient, which is the relationship between the dependent variable (maternal mortality) and the independent variable (social-cultural practices is.422, which is a low correlation.

Table 6: Coefficients[a]

	Model	Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.092	.146		7.483	.000
	PRACTICE	.452	.056	.422	8.139	.000

a. Dependent Variable: Mortality

The R square column in Table 4 shows that the coefficient of multiple determination is .175, which implies that social-cultural practices account for 17.5% of the variance toward maternal mortality. While social cultural practices demonstrated the predictability of the maternal mortality, the table excluded knowledge, equality and facility from predicting the maternal mortality.

Accordingly, the correlation coefficient (the relationship between social-cultural practices and maternal mortality) is .422, which is a low correlation. In table 5, the model was a significant predictor of maternal mortality ($p < .000$). With the p-values of .000 in Table 5, we partially reject the null hypothesis while maintaining that social-cultural practices affect maternal mortality in Longido District. From Table 6, social-cultural practices (β = .452, $p < .000$) contributed significantly to the model. The final predictive model is Y=.432X +1.092, where X= social-cultural factors. Therefore, social-cultural practices account for maternal mortality by 17.5%. Similarly, previous studies indicated the contribution of socio-cultural factors to maternal mortality(Joseph & Mtae, 2023; Felisian et al., 2023;Abraham, 2024).

The fact that social-cultural practices accounted for only 17.5% of maternal mortality suggests that other factors, apart from those included in this study, may account for maternal mortality in Longido District These may include environmental and economic, factors, disorganized health systems and maternal health conditions (Souza et al., 2024).

Conclusions and Recommendations
Conclusions
Based on the findings, the study concludes that although respondents possessed essential knowledge to prevent maternal mortality, they also possessed negative opinions that could delay their actions against maternal mortality. Such negative perspectives include dependence on religious leaders' help over medical support, considering maternal mortality as resulting from superstitions and the use of traditional concoctions instead of consulting medical experts.

Although women's readiness to reach the health care facilities prevailed, male partners' willingness to escort their wives to the health care facilities did not exist. Therefore, male-female partnerships in reaching the healthcare facilities emerged as a challenge. Furthermore, the care received from medical facilities sounds unsatisfactory due to limited medical personnel, facilities and equipment. Finally, social-cultural practices predicted the maternal mortality in Longido District.

Recommendations
Based on these conclusions, the study recommends that strengthening community awareness and positivity towards services will alleviate delays and reduce maternal mortality. Enhancing family and spousal support towards decision-making and financial support will overcome barriers to care, improve maternal health, and consequently reduce maternal mortality. Finally, strengthening the health system by sustaining resources, accountability and an improved working environment are essential steps towards enhancing the quality of care and consequently reducing the maternal mortality.

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