

Special Article – Family Caregivers

Determinants of a Household's out of Pocket Cost when Seeking Facility Delivery Services in three Rural Districts of Tanzania: Rufiji, Ulanga, and Kilombero

Tani K^{1*}, Kanté AM^{1,2,3}, Manzi F¹, Exavery A¹, Njozi M¹, Hingora A¹ and Phillips JF²

¹Ifakara Health Institute, Dar es Salaam, Tanzania

²Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University, USA

³Swiss Tropical and Public Health Institute, University of Basel, Socinstrasse 57, CH-4002 Basel, Switzerland

*Corresponding author: Kassimu Tani, Ifakara Health Institute, Dar es Salaam, Tanzania

Received: May 01, 2016; Accepted: May 19, 2016;

Published: May 23, 2016

Abstract

Background: While it is recognized that out of pocket costs associated with care and delivery in health facilities are prohibitive to many households, more has to be learned about the specific factors led to differences in costs incurred. The study aims to get more insight of the factors that determines difference in out of pocket costs between households, seeking delivery services at facilities. The health policy on exemptions and a number of interventions on maternal health depict provision of the services for free.

Methods: Data originate from a cross-sectional survey on health behavioral and service utilizations patterns indicators. The study identified 915 women of reproductive age who delivered within two years prior the survey in 2011 in Rufiji, Kilombero and Ulanga districts in Tanzania. Out of these 682 had delivered at a facility and were deemed eligible for analysis. The out of pocket cost components included in the model were the delivery consultation fee, payments for drugs, payment for medical supplies, and travel expenses. The total cost was categorized into three levels: no cost (0/= Tshs), low cost (1 to 20,000/= Tshs) and high cost (greater than 20,000/=Tsh). Multinomial logistic regression was used to assess the relationships between potential determinants and out of pocket costs.

Results: Findings revealed that the travel time and the mode of transportation to reach the health facility were significantly associated with cost of delivery. Mothers who traveled to the facility by bicycle or motorized vessel were more likely to spend more money than those traveling on foot. Also, the level of the facility is significantly associated with cost of delivery. The high cost category was 18.59 (95% CI 7.06 – 48.97) more likely to be incurred for mothers who delivered at the hospital than those who delivered at the dispensary. Also, the high cost category was 5.32 (95% CI 1.88 – 15.07) more likely to be incurred for a caesarian-section compared to a normal delivery.

Conclusion: The decision regarding which health facility a women attempt to receive delivers services is significantly influenced by a number of factors of which they are seems to be known but subsequently still determines differences in out of pocket costs of delivery services. This appears to persist and might continue to create the fair to the health care seeker and lead them to end up to the facilities that will not provide appropriate services as required in a required time. The high cost of delivery was mainly associated with the type of delivery and means of transport used to reach the health facility and also with the level of health facility. This may have been driven by delay caused by the burden of the out of the pocket the community faces. In order to minimize costs that are resulting from unexpected emergency visits to health facilities, research is needed to assess how community health programmes of community health worker who they can work full time within their residence areas can influence early preparation for delivery in health facilities with appropriate needed services.

Keywords: Out of pocket cost; Health facility delivery; Determinant of cost; Tanzania

Introduction

The potentially prohibitive out-of-pocket cost associated with seeking pregnancy and delivery care in health facilities in low-income countries has gained focus as a potential barrier to accessing

appropriate maternal health care. Many households globally face economic distress as family member's approaches delivery [1] due to the impending out of pocket cost burden. While it is becoming increasingly recognized that out of pocket costs associated with care and delivery in health facilities are prohibitive for many households,

more has to be learned about the specific factors that determine these costs, as it's clearly defined that the delivery as one of maternal services is exempted. Identification of such determinants and their directions would inform programmatic efforts for their reduction, thus alleviating a barrier to maternal health care access and ultimately reducing maternal deaths.

The global maternal mortality ratio (MMR) for 30 poor countries including Tanzania has been reduced by one-third between 1990 and 2008 [2]. While encouraging, this rate of decrease was not sufficient to achieve the Millennium Development Goal (MDG) 5 target of reducing the MMR by three quarter between 1990 and 2015. To meet this goal, the annual decline would have to be 5.5% as opposed to 2.3% (the average annual decline since 1990 - 2008) due to poor progress by 30 countries among 23 are sub Sahara Africa [2-3]. Immediate action is needed by governments and organizations to accelerate the decline in order to achieve MDG 5. According to the Tanzania Demographic and Health Surveys (TDHS) from 1995-2004, the MMR has slowly declined from 578 maternal deaths per 100,000 live births in 1995 to 454 per 100,000 in the ten years preceding the 2010 TDHS [4-5]. As one of the poorest countries in Africa, Tanzania faces critical shortages in several areas that contribute to its persistently high MMR, including availability of skilled health workers, drugs, equipment, and infrastructure [6].

Deaths from hemorrhages and preeclampsia account for half of the maternal deaths in many developing countries, including Tanzania [7]. The hemorrhages and preeclampsia can be prevented if the women deliver in health facility with supplies and inexpensive services that real target the poor in all means. In 2010, 50% of deliveries took place in health facilities and 51% of all deliveries were attended by a health professional, representing an increase of about 5% from 2004-2005 [5]. While this increase is positive, many deliveries still take place outside of facilities and without a skilled attendant. It is known that having a proper medical care, hygiene, and attention during delivery at a low cost to the household reduce risks of complications or infections that may result in serious illnesses, death of a mother, or death of a newborn. Deaths from preventable causes could be avoided through interventions that assist mothers in reaching skilled health care providers with adequate equipment and supplies for delivery [8]. These interventions must achieve reduction of the out of pocket cost received when community members seek maternal health services. Access to adequate and affordable care can be facilitated and strengthened by community health workers (CHW) [9] who encourage delivery in facilities and make home follow-up visits to advocate for all necessary care and the preparations needed.

Studies have identified a range of social, economic, and geographic factors that contribute to differential utilization of skilled maternity care during childbirth [10] as a result of the presence of out of pocket costs. Household background characteristics and costs of accessing health services have been shown to be an important barrier to a woman's use of facility-based maternity care [11-12]. Other factors that may influence care seeking behavior are quality and level of care (facility level), distance to the facility, means of transport to health facilities where skilled care is available, socio-economic status (SES), education level, decision-making power, autonomy, and cultural norms that encourage home birth and/or discourage the use of facility-based care [12-14]. This study aims to further explore these

potential determinants of out-of-pocket costs as it is been charged to a number of maternal services.

Direct out of pocket costs associated with maternity care at facilities include official fees charged for delivery care, bed stay, required drugs and supplies [15]. Specific fees for these materials and services vary from one facility to another based on the level and ownership of the facility [14]. In view of the regressive nature of user fees and the negative impacts they have on utilization of preventive maternal health services like antenatal care, delivery, and postnatal care, many countries in the sub-Saharan region have instigated initiatives to reduce or eliminate these costs [15].

In addition to fees incurred at the facility and cost for supplies that woman has to prepare, direct costs of seeking maternity care include transport to and from the health facility, food for the pregnant mother, and accommodation for the family members accompanying her [16-17] for cases where health facility is far from the women residency. These alone constitute more than 50% of all direct costs associated with seeking pregnancy and delivery care in health facilities [11,14,18].

In addition to direct expenditure, households face indirect costs such as wage loss [11,17]. Indirect costs are difficult to measure since they depend on income and employment status and may vary with seasons for some occupations such as farming. Some studies suggest that indirect costs exceed direct costs incurred by the family when seeking health services [18-19].

These payments in seeking health services have been a barrier to use of health facilities [14]. Most studies show that, health facility services utilization are minimum due to prohibitive fees. This is more prominently experienced by poor families since compliance with the cost required is difficult [20]. Some studies further indicate that some families are driven to borrow money or sell their assets to afford health services [14]. It is crucial to understand the determinants of out of pocket cost that arise when seeking maternity services within health facilities in order to alleviate these costs as a barrier to seeking skilled care.

The aim of the study is to get more insight and understands in details the factors that determine differences in out of pocket costs between households seeking facility delivery services with all focus and interventions towards MDG 5. This will strengthen the literature on what is going on to the known factors after the global effort towards strengthening attainment of maternal services.

Methodology

Study area, population, design and sampling

This study was done in Rufiji, Kilombero, and Ulanga districts of rural Tanzania. The districts are located in Health and Demographic Surveillance Systems (HDSS) where the population is followed for a number of years. Participants were identified as the women residing in the HDSS area aged 15-49 years who had delivered within 24 months prior to the day of the survey [21-22].

The study districts were predominantly rural, yet also included some households clustered around small towns. Subsistence farming, fishing, and small-scale trading represent the main sources of the districts' economies [23-24].

Baseline household survey data from *The Connect Project* was utilized for this study. The Ifakara Health Institute (IHI), in partnership with Columbia University's Mailman School of Public Health initiated the *Connect Project* in 2010, a 6-year project in Rufiji and Ifakara HDSS focused on accelerating achievement of MDGs 4 and 5. This project tests interventions to strengthen the continuum of care from household to health facility and to determine how this impacts maternal and child mortality, particularly newborn mortality. The main intervention of this project is introduction of paid community health workers known as Community Health Agents (CHA) into the Tanzanian health system. CHAs are trained formally and deployed at the community level to provide a package of health services within the community. Additionally, CHAs connect community members to health facilities and engage in risk identification and management [25-26].

Before the CHA intervention, a baseline household survey was conducted between May and July 2011 to assess health seeking behavior and service utilization patterns of women of reproductive age for themselves and their children under-five years old. The cross-sectional survey was designed, organized, and data were collected using a standard interviewer-administered questionnaire mainly comprised of closed-ended questions including questions regarding costs associated with health care. Data regarding background characteristics and pregnancy care were used to identify the determinants of household out of pocket payment during maternity.

Data collection

All respondents were asked their level of education, age at the last birthday, ethnic group, marital status, religion, occupation, and household characteristics. Women of reproductive age who gave birth in the previous 2 years were asked a detailed series of close-and open-ended questions about their recent delivery experiences, including the costs of seeking care.

Questions regarding the cost of seeking maternal care explored direct costs for drugs and medical supplies incurred during delivery, including formal and informal fees. Further questions explored how much they paid for services (e.g., delivery charges, bed stay, and laboratory fees), how much they paid for equipment (personal prepared delivery kit), means of transport used to reach the facility, time spent to the facility, and the transport fare to and from the facility. All costs were reported in the local currency (Tanzania shillings). Other direct costs such as food, gifts, and upkeep of accompanying persons were not explored.

Within this study, out of pocket costs for delivery services were defined as all payments made by the family/household when seeking care for mothers either from a public or private health provider. Out of pocket cost components included registration fees, consultation fees, payments for drugs and medical supplies, and travel expenses [17].

Household assets were used to assess socioeconomic status via principle components analysis. This type of analysis is routinely used to measure household wealth due to difficulty in collecting accurate information on household income and expenditure [11,27]. The principle component analysis assigns weights to each household asset according to the relative importance of each asset in terms of

representing the overall asset in the household [28].

Data analysis

The study identified 915 women aged 15-49 years old who had delivered within two years prior the survey. Out of these 682 had delivered at a facility and were deemed eligible for analysis.

The out of pocket cost components were the delivery consultation fee, payments for drugs, payment for medical supplies, and travel expenses. Depending on how fees were collected in the various facilities and how the woman assures of having all necessary requirements, respondents answered questions about payments for drugs, supplies, and delivery costs either as separate or combined costs. The response from uncombined cost was combined and total of out of pocket costs for delivery services was used in this analysis. And from the levels of out of pocket cost been declared, showed they can be reflected from best three categories. These are no cost for those who paid nothing at facility and mostly went there on foot i.e. they paid nothing to arrive at facility, low cost for those who paid for or prepared their own delivery kit and went with it to the facility and high cost for those who happened to pay more for a number of services. So the total cost was categorized into three levels: no cost (0/= Tshs), low cost (1 to 20,000/= Tshs) and high cost (greater than 20,000/=Tsh). Other variables included in the study were time spent to reach the facility (0-30 minutes, 31-60, 61-120 and more than 120), socio-economic status (wealth quintile), means of transport to the health facility (foot, bicycle, motorcycle, car), type of facility attended (dispensary, health center and hospital), economic activity of the mother (farmer, handcraft/business, domestic work), type of delivery (caesarian-section or normal delivery), residence type (town or village), education level (no education, primary and secondary) , marital status (married or not married) and age of the mother.

Summary statistics were analyzed by frequency distribution of each variable. Then, multinomial logistic regression was used to examine which factors that determine variation in expenditure during delivery, controlling for possible confounders. Relative risk ratios (RRR) and their corresponding 95% confidence intervals (95% CI) were calculated. Analysis was performed using Stata (version 12) statistical software.

Ethical approval

Ethical approval for the main survey was granted by the Medical Research Coordinating Committee (MRCC) of the National Institute for Medical Research (NIMR) in Tanzania. During the survey, participation was voluntary and each woman signed (or provided a thumb print if she cannot write) a statement of an informed consent before interview. For legal reasons, an assent was sought for participants less than 18 years of age. Data storage and processing were handled securely within the Ifakara Health Institute where the *Connect Project* is based.

Results

The result depict that mothers delivered at health facilities, their median age was 27 years (range 15 – 51) and 78% of mothers resided in rural villages. We found that 20% of mothers did not attend school at all, while 72.4% had primary level of education and 6.2% had secondary and tertiary level. About 78% of the mothers were married.

Table 1: Socio-demographic characteristic of mothers in Rufiji, Ulanga and Kilombero districts of Tanzania (n = 682).

Variable	n	%
Out of Pocket Cost		
No cost	116	17.01
low cost (1 < 20,000/= Tshs)	381	55.87
High cost (≥ 20,000/= Tshs)	185	27.13
Education		
No education	146	21.41
Primary education	494	72.43
Secondary +	15	6.16
Age (Years)		
Under 20	105	15.40
20 to 34	413	60.56
34 to 49	164	24.05
Marital Status		
Married	532	78.01
Not married	117	21.99
Time spent to reach facility		
0 - 30 min	284	41.64
31 – 60 min	156	22.87
61 – 120 min	134	19.65
≥ 120 min	108	15.84
Means of transport		
Foot	193	28.42
Bicycle	196	28.87
Motorcycle	71	10.46
Car	146	21.50
Lorry	14	2.06
Bus	42	6.19
Tricycle	12	1.77
Ambulance	5	0.74
Type of facility delivery		
Dispensary	157	24.62
Health Centre	151	22.15
Hospital	363	53.13
Type of delivery		
Normal delivery	565	82.84
C/section	117	17.16
Activity		
Farmer	225	32.99
Handcraft/business	52	7.63
Domestic work	268	39.29
Residence		
Town/small town	148	21.70
Village	534	78.30

Source: Household survey, CONNECT 2011.

From the sampled women more than half (53%) delivered at the hospital, 22% at the health centre and 25% at the dispensary. And 18% delivered were caesarean section. About 28% of mothers reached the health facility by foot and the same percent used bicycle while the others used motorized vessel (Table 1).

The majority of the mothers (83%) reported out of pocket costs associated with accessing maternal care in the “high” and “low” cost categories, indicating that only a minority (17%) of mothers incurred no out of pocket costs.

The median total expenditure was 12,500/= (Tshs) (8.3\$USD) with a range of 0 Tsh to 202,500/= Tsh (134.1 \$USD) per mother. On average transport constituted 26% of the total cost, facility charges constituted 56%, and drug and medical supplies constituted 18%. Median expenditure per mother for transport was 5000/= Tshs (3.3 \$USD), for facility fees was 11,500 Tshs (7.6 USD), and for drugs and supplies was 5,000 Tshs (3.3 \$USD). Caesarean section cases showed the highest median cost of 41,200/= Tshs (27.2 \$USD) compared to the median cost of normal delivery which was 10,650/= Tshs (7.1 \$USD).

Findings revealed that the travel time to reach the health facility was significantly associated with cost of delivery. For every additional minute of travel duration, the RRR of incurring low cost was 1.004 times higher (95% CI 0.999 – 1.008) compared to no cost. Also the RRR was 1.01 times higher for the high cost compared to the no cost category (95% CI 1.01 – 1.02) (Table 2).

Mode of transportation was also seen as a predictor of costs of delivery. Results indicated that mothers who traveled to the facility by bicycle were 2.30 (95% CI 1.34 – 3.94) times more likely to incur low costs than those who traveled by foot. Similarly, cost of delivery in the low cost category was 5.91 (95% CI 2.90 – 12.06) times more likely to be incurred when traveling by motorized vessel compared to traveling on foot. Additionally, cost of delivery in the high cost category resembled the pattern observed in the low cost for motorized vessel, such that mothers who traveled by motorized vessel versus on foot showed a RRR of 13.52 (95% CI 5.64 – 32.55). Those who traveled by bicycle showed a RRR of incurring a cost in the high cost category was 1.77 (0.75 – 4.15) times higher compared to those who traveled on foot (Table 2).

There was an association between the level of health facility visited and the cost of delivery. Mothers who had delivered at the health centre were 0.55 (95% CI 0.31– 0.96) less likely to pay a cost within the low cost category compared to those who delivered at the dispensary. However, mothers who had delivered at the hospital were 5.12 (95% CI 2.37 – 11.04) more likely to pay in the low cost category compared to those who delivered at the dispensary. For the high cost category, mothers who delivered at the health center were 0.68 (95% CI 0.25 – 1.78) less likely to pay more compared to those who delivered at the dispensary. Those who delivered at the hospital were 18.74 (95% CI 7.10 – 49.45) more likely to pay in the high cost category compared to those who delivered at the dispensary (Table 2).

Results revealed that, type of delivery determined amount paid during delivery, such that costs in the low cost category were 0.71 (95% CI 0.26 – 1.95) less likely to be paid for a caesarian section

Table 2: Multivariate logistic regression of factors determining delivery cost in the medium and high cost relative to low cost in Rufiji, Kilombero and Ulanga districts of Tanzania, 2011 (n = 682).

Variable	Determinant of cost in the "Low cost" relative to the "No cost"			Determinant of cost in the "High cost" relative to the "No cost"		
	Relative risk ratio (RRR)	95% confidence interval (CI)		Relative risk ratio (RRR)	95% confidence interval (CI)	
Time spent to reach facility (min)	1.004*	0.99 -	1.008	1.01***	1.01 -	1.02
Means of transport						
Foot	1.00			1.00		
Bicycle	2.30**	1.34 -	3.94	1.77	0.75 -	4.15
Motorized vessel	5.91***	2.90 -	12.06	13.52***	5.64 -	32.55
Facility level						
Dispensary	1.00			1.00		
Health centre	0.55***	0.31 -	0.96	0.68	0.25 -	1.78
Hospital	5.12***	2.37 -	11.04	18.74*	7.10 -	49.45
Type of delivery						
Normal delivery	1.00			1.00		
Caesarian section	0.71	0.26 -	1.95	5.32**	1.87 -	15.09
Activity of the mother						
Domestic work	1.00			1.00		
Farmer	1.11	0.63 -	1.92	1.53	0.74 -	3.12
Contract work	1.71	0.48 -	6.10	1.39	0.34 -	5.71
Education						
No education	1.00			1.00		
Primary education	1.02	0.57 -	1.85	1.45	0.64 -	3.29
Secondary education	1.65	0.35 -	7.74	4.91	0.85 -	28.23
Residency						
Rural	1.00			1.00		
Urban	1.80	0.83 -	3.87	2.33	0.91 -	5.92
Age of the mother						
Age (linear)	0.99	0.96 -	1.03	1.01	0.96 -	1.05
Marital status						
Married	1.00			1.00		
Not married	1.31	0.69 -	2.51	0.93	0.41 -	2.08
Wealth of Household						
Poor	1.00			1.00		
Middle	0.91	0.50 -	1.63	1.39	0.65 -	2.98
Rich	0.96	0.47 -	1.99	0.57	0.22 -	1.45
District						
Rufiji	1.00			1.00		
Kilombero	0.64	0.30 -	1.37	0.78	0.30 -	2.01
Ulanga	0.28**	0.11 -	0.67	0.10*	0.03 -	0.34

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$.

Source: Household survey, CONNECT 2011

compared to a normal delivery. Costs in the high cost category were 5.32 (95% CI 1.87 – 15.09) more likely to be incurred for a caesarian section compared to a normal delivery (Table 2). Findings showed that mothers who lived in Rufiji were more likely to spend money for delivery services compared to those who lived in Ulanga and Kilombero. However, the cost of delivery was not significantly

associated with the factors of age, education, marital status and wealth quintile.

The results of interaction between the district of residence and type of delivery revealed that Ulanga had the lowest proportion of caesarian sections (11.4%), Kilombero the highest proportion (19.3%) and Rufiji the medium proportion (16.0%) (Table 3).

Table 3: Proportional of facility delivery by district (Rufiji, Kilombero and Ulanga), Tanzania.

District	Delivery (n)	Normal delivery (%)	Caesarian section (%)
Rufiji	175	84.0	16.0
Kilombero	393	80.7	19.3
Ulanga	114	88.6	11.4
Total	684	82.8	17.3

Source: Household survey, CONNECT 2011.

Discussion

Multiple factors were seen to be significantly influential to the out of pocket costs incurred by households when seeking delivery in health facilities. Further examination of these factors can highlight reasons for the differential cost and indicate potential areas for cost mediation.

The study showed that time to reach the health facility and type of transport influence differences in costs paid when seeking delivery services. Time spent to reach a health facility was seen as a factor contributing to differences in the amount paid during delivery. As the mother's traveling time increased [29], the cost increased. This is likely due to lack of reliable means of transport [29-30] to reach health facilities and poor road infrastructure that forces less private investment in public transportation services.

The study found significant differences between the costs of delivery when traveling with bicycle or motorized vessel compared to traveling on foot. This differential cost is likely due to the need to purchase fuel, hire a car, motorcycle, or bicycle, or to pay a bus fare when looking for a health facility that is well equipped and has a qualified and trusted doctor that can address emerging complications [31]. There are few facilities qualified to provide comprehensive emergency obstetric care and those that exist are allocated far from rural communities. Another study that analyzed out of pocket costs for delivery services [14] similarly showed that a large portion of out of pocket cost (53%) was attributable to transportation cost. This shows that the interventions currently going on toward achieving MDG 4 have to look on the possibility of reducing the distances to the area of services if the intention is to assist the community to incur less and get required services. The distance to the basic health facilities is not a problem but, the emphasis has to be on facilities that can provide comprehensive emergency obstetric care.

The study showed a relationship between the facility level chosen for maternity care and cost of delivery. Surprisingly, the cost of delivery at a health center was less than the cost at dispensaries. This lower cost experienced when delivering at health centers could be a result of upgrading health centers in Rufiji, Kilombero, and Ulanga districts. The Ifakara Health Institute assisted in upgrading the Kibiti health center, Lupiro health center, Mtimbira health center, Mlimba health center, and Mang'ula health center under the project called "Empower" between 2007 and 2012 by equipping existing maternity wards with supplies and trained staff, and building maternity wards where necessary. This upgrade increased availability of delivery necessities at the health centers [32] and reduced the extent of out of pocket costs, making them lower than costs at the dispensary since mothers must purchase their own delivery kits at dispensaries due to shortages of supplies [6].

Additionally, results showed that the cost of delivery at the hospital was likely to be higher [11] since only one government district hospital provides services at the district level, forcing many mothers to deliver in more costly private facilities [32] or have to travel far to reach district hospital. Adding to the cost, government hospitals tend to be farther away from many households, necessitating transportation and other living cost paid out of pocket. Many non-government hospitals provide delivery services at specified fees that vary from one mother to the other based on the number of days stayed at the hospital, availability of materials and equipment, number and level of personnel delivering services, and role of the facility [33].

Out of pocket costs for delivery varied with the type of delivery [11]. The study showed that those who delivered by caesarian section were more likely to pay high costs compared to those with normal delivery. Similar studies conducted in Ghana and Benin showed that normal deliveries represent 2% of the annual expenditure and cases of obstetric complication represent 34% of the annual expenditure [19]. Ultimately, multiple factors influence the out of pocket costs incurred by households when they seek maternity care within health facilities, offering multiple avenues for intervention to alleviate these costs as a barrier to seeking skilled care.

Among the factors associated with facilities delivers are age, education level, marital status and wealth quintile but the study revealed that they were not significant in influencing out of pocket. This confined to the study on similar study but on institutional delivery by Amon et al (2014) which showed that these factors are no longer challenge to access facility delivery [34].

Conclusion

The decision regarding where a women attempt to seek and receive the delivers services is significantly influenced by a number of factors and subsequently still determines differences in out of pocket costs of delivery services. This appears to persist and might continue to create the fear to the health care seeker and lead them to end up to the facilities that will not provide appropriate services as required in a required time. The high cost of delivery was mainly associated with the type of delivery, means of transport used to reach the health facility and also with the level of health facility. This may have been driven by delay caused by the burden of the out of the pocket the community faces. Further research must be done to assess how community health workers programmes of community health worker who they can work full time within their residence areas can influence early preparation for delivery in health facilities to minimize costs that result from unexpected and emergency visits to health facilities with appropriate needed services.

Author Contribution

KT conceptualized the research question, designed the study, executed data analysis and wrote the manuscript. AMK participated in designing the study, data analysis and critical review of the manuscript. AMK, FM, AH and JFP designed the primary study and critically reviewed and contributed to further writing of the current manuscript together with AE, and MN. All the authors read and approved the final draft of the manuscript.

Acknowledgements

We sincerely thank the study participants, the Connect project

team constituted by John Noronha, Kate Ramsey, Colin Baynes, Hilda Mushi, Gloria Sikustahili, Ruth Wilson, Awena Malendo, Dominick Mboya, Doroth Maganga and Samweli Likas for their cooperation and assistances during data collection. We also thank Allison Stone and Anna Larson for editing the script and the Doris Duke Charitable Foundation (DDCF) and Comic Relief for funding the Connect project from which this paper emanates.

References

- Anderson I, H Axelson and BK Tan. The other crisis: the economics and financing of maternal, newborn and child health in Asia. *Health Policy Plan.* 2011; 26: 288-297.
- WHO U, UNFPA. The World Bank, Trends in maternal mortality 1990-2008: estimates developed by WHO, UNICEF, UNFPA and The World Bank. Geneva: World Health Organization; 2010. 2010.
- Lozano R, et al. Progress towards Millennium Development Goals 4 and 5 on maternal and child mortality: an updated systematic analysis. *Lancet.* 2011; 378: 1139-1165.
- Angela E, Shija JM, Leonard EG, Mboera. Maternal health in fifty years of Tanzania independence: Challenges and opportunities of reducing maternal mortality. *Tanzania Journal of Health Research.* 2011; 13: 352-364.
- URT. Tanzania Demographic and Health Survey 2010. 2011, National Bureau of Statistics Dar es Salaam, Tanzania: Dar es Salaam.
- Kwesigabo G, Mwangi MA, Kakoko DC, Warriner I, Mkony CA, Killewo J, et al. Tanzania's health system and workforce crisis. *J Public Health Policy.* 2012; 33 Suppl 1: S35-44.
- Walraven GE, Mkanje RJ, van Roosmalen J, van Dongen PW, Dolmans WM. Assessment of maternal mortality in Tanzania. *Br J Obstet Gynaecol.* 1994; 101: 414-417.
- Lewin S, Munabi-Babigumira S, Glenton C, Daniels K, Bosch-Capblanch X, van Wyk BE, et al. Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases. *Cochrane Database Syst Rev.* 2010; : CD004015.
- Pfeiffer C, Mwaipopo R. Delivering at home or in a health facility? health-seeking behaviour of women and the role of traditional birth attendants in Tanzania. *BMC Pregnancy Childbirth.* 2013; 13: 55.
- Adler NE and K Newman. Socioeconomic disparities in health: pathways and policies. *Health Aff (Millwood).* 2002; 21: 60-76.
- Perkins M, et al. Out-of-pocket costs for facility-based maternity care in three African countries. *Health policy and planning.* 2009; 24: 289-300.
- Kitui J, Lewis S, Davey G. Factors influencing place of delivery for women in Kenya: an analysis of the Kenya demographic and health survey, 2008/2009. *BMC Pregnancy Childbirth.* 2013; 13: 40.
- Kamal SM. Preference for institutional delivery and caesarean sections in Bangladesh. *J Health Popul Nutr.* 2013; 31: 96-109.
- Kruk ME, Mbaruku G, Rockers PC, Galea S. User fee exemptions are not enough: out-of-pocket payments for 'free' delivery services in rural Tanzania. *Trop Med Int Health.* 2008; 13: 1442-1451.
- Perkins M, Brazier E, Themmen E, Bassane B, Diallo D, Mutunga A, et al. Out-of-pocket costs for facility-based maternity care in three African countries. *Health Policy Plan.* 2009; 24: 289-300.
- Desgualdo CM, Riera R, Zucchi P. Cost estimate of hospital stays for premature newborns in a public tertiary hospital in Brazil. *Clinics (Sao Paulo).* 2011; 66: 1773-1777.
- Hodek JM, JM von der Schulenburg and T Mittendorf. Measuring economic consequences of preterm birth - Methodological recommendations for the evaluation of personal burden on children and their caregivers. *Health Economics Review.* 2011; 1: 6.
- Borghji J, Ensor T, Neupane BD, Tiwari S. Financial implications of skilled attendance at delivery in Nepal. *Trop Med Int Health.* 2006; 11: 228-237.
- Borghji J, Hanson K, Acquah CA, Ekanmian G, Filippi V, Ronsmans C, et al. Costs of near-miss obstetric complications for women and their families in Benin and Ghana. *Health Policy Plan.* 2003; 18: 383-390.
- Jammeh A, Sundby J, Vangen S. Barriers to emergency obstetric care services in perinatal deaths in rural gambia: a qualitative in-depth interview study. *ISRN Obstet Gynecol.* 2011; 2011: 981096.
- Mrema S, Kante AM, Levira F, Mono A, Irema K, de Savigny D, et al. Health & Demographic Surveillance System Profile: The Rufiji Health and Demographic Surveillance System (Rufiji HDSS). *Int J Epidemiol.* 2015; 44: 472-483.
- INDEPTH, Rufiji DSS. 2012.
- Ramsey K, et al. The Tanzania Connect Project: a cluster-randomized trial of the child survival impact of adding paid community health workers to an existing facility-focused health system. *BMC Health Serv Res.* 2013; 13: Suppl 2: S6.
- Exavery A, Kanté AM, Jackson E, Noronha J, Sikustahili G, Tani K, et al. Role of condom negotiation on condom use among women of reproductive age in three districts in Tanzania. *BMC Public Health.* 2012; 12: 1097.
- Exavery A, Kanté AM, Jackson E, Noronha J, Sikustahili G, Tani K, et al. Role of condom negotiation on condom use among women of reproductive age in three districts in Tanzania. *BMC Public Health.* 2012; 12: 1097.
- Connect. The CONNECT Project. Ifakara Health Institute (IHI). 2010.
- Najnin N, Bennett CM, Luby SP. Inequalities in care-seeking for febrile illness of under-five children in urban Dhaka, Bangladesh. *J Health Popul Nutr.* 2011; 29: 523-531.
- Ringné M. What is principal component analysis? *Nat Biotechnol.* 2008; 26: 303-304.
- Killewo J, Anwar I, Bashir I, Yunus M, Chakraborty J. Perceived delay in healthcare-seeking for episodes of serious illness and its implications for safe motherhood interventions in rural Bangladesh. *J Health Popul Nutr.* 2006; 24: 403-412.
- Mrischo M, Schellenberg JA, Mushi AK, Obrist B, Mshinda H, Tanner M, et al. Factors affecting home delivery in rural Tanzania. *Trop Med Int Health.* 2007; 12: 862-872.
- Parkhurst JO, SA Rahman and F Ssengooba. Overcoming access barriers for facility-based delivery in low-income settings: insights from Bangladesh and Uganda. *J Health Popul Nutr.* 2006; 24: 438-445.
- Kruk ME, Hermosilla S, Larson E, Mbaruku GM. Bypassing primary care clinics for childbirth: a cross-sectional study in the Pwani region, United Republic of Tanzania. *Bull World Health Organ.* 2014; 92: 246-253.
- Levin A, Dmytraczenko T, McEuen M, Ssengooba F, Mangani R, Van Dyck G. Costs of maternal health care services in three anglophone African countries. *Int J Health Plann Manage.* 2003; 18: 3-22.
- Exavery A, Kanté AM, Njozi M, Tani K, Doctor HV, Hingora A, et al. Access to institutional delivery care and reasons for home delivery in three districts of Tanzania. *Int J Equity Health.* 2014; 13: 48.