

# Are bicycle ambulances and community transport plans effective in strengthening obstetric referral systems in Southern Malawi?

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## Abstract

### Setting.

Nsanje District in the Southern Region of Malawi

### Objectives.

- \* To determine the time taken, cost-effectiveness and cultural acceptability of bicycle ambulances (BAs) and established community transport plans (CTPs) in the referral of obstetric cases.
- \* To determine whether the presence of bicycle ambulances and established transport plans decrease home delivery rates.

### Methods.

We conducted a community-based case control study in Traditional Authority Tengani in Nsanje District. We used both qualitative and quantitative methods to collect data from ten villages within a 5-kilometre radius of three Basic Essential Obstetric Care (BEOC) facilities. Four villages were enrolled as 'cases' while the other six were controls. Of the four 'case' villages, two were provided with bicycle ambulances and two developed community transport plans; the six control villages lacked both bicycle ambulances and community transport plans. Prior to the intervention, 30 homogenous focus group discussions (FGDs) explored experiences and perceptions of modes of transport with elders, chiefs, women of child bearing and their partners. Retrospective interviews were conducted with women delivering six months prior to the study (n=92) to obtain baseline data, whilst prospectively 157 deliveries were registered.

### Results.

Approximately 90 minutes of travel time was required with all forms transportation studied. Important cultural beliefs deterred most pregnant women from using the bicycle ambulances. People believe that publicising the onset of labour summons evil spirits resulting in obstructed labour. This explains why general medical cases used BAs more frequently than obstetric cases. However, home delivery rates in case villages decreased from 37% to 18% (P<0.005).

**Conclusions.** In this study we were unable to demonstrate any benefit for obstetric referral systems when BAs and CTPs were introduced. The dearth of international literature coupled with these findings highlight the need for further detailed studies prior to wide-scale adoption of transport schemes.

## Introduction

Maternal mortality is a critical problem in many developing countries. In Malawi the Maternal Mortality Ratio (MMR) is estimated at 620 per 100,000 live births [1]; translating into 3,000 maternal deaths and 40,000 chronic complications every year.

The Malawi Government has established a National Safe Motherhood Programme in an attempt to lower the unacceptably high levels of maternal mortality and morbidity. With support from DFID, the programme was established in the Southern Region in 1998 as the *Safe Motherhood Project*.

One of the four outputs of the Safe Motherhood project is to strengthen referral systems in the Southern Region of Malawi. One of the major activities planned within the project to achieve this output is to improve the emergency transfer of women seeking obstetric care from village to the nearest maternity unit through the provision of *bicycle ambulances* at community level.

Although 80% of the population in Malawi has access to health services, many pregnant women face great difficulties reaching health facilities for a normal or complicated delivery. Transport remains a major concern. Previous studies [2] done in the project area have shown that 69% of women walk to health centres despite the severity of their obstetric condition. On average, they travel 2-5 kilometres and 42% of them live more than 2 hours away from a health centre. One solution to this problem is to organise emergency transport. This has been tried in the form of bicycle ambulances by various Non-governmental organisations (NGOs). However, there is little documented evidence on their effectiveness. Anecdotal evidence has also suggested that many bicycle ambulance trailers are lying idle in many health centres in the Southern Region of Malawi.

Prior to funding the provision of bicycle ambulances on a wider scale, we therefore conducted a study to investigate the effectiveness of bicycle ambulances and community transport plans for the emergency referral of pregnant women in labour or with obstetric complications from village to their nearest health facilities. Specifically, we set out:

- \* To determine the time taken to transport pregnant women in labour or with emergency obstetric complications using different modes of transport from village to their nearest health centres.
- \* To compare the cost-effectiveness of different modes of transportation.
- \* To investigate cultural acceptability of these different modes.
- \* To determine whether or not the provision of bicycle ambulances and the introduction of community transport plans decrease home delivery rates.

## Materials and methods

The study was conducted in ten randomly selected villages in Traditional Authority Tengani in Nsanje District over a period of six months (from 18 July, 1999 to 19 January, 2000). The

study villages were located within a 5-kilometre radius of three Basic Essential Obstetric Care (BEOC) facilities. Distance, topography, culture and ethnicity were considered when controlling for sites.

This was a community-based case-control study. The transportation of women in labour or with obstetric complications in case villages was compared with controls. A case village was defined as one with either a bicycle ambulance or an established community transport plan. A control village had neither a bicycle ambulance nor an established transport plan.

The research employed both qualitative and quantitative methods. Firstly, 30 focus group discussions (FGDs) were conducted in all study villages during the pre intervention phase to determine the existing modes of transport and villager's experiences, and to obtain their informed consent. Secondly, the research team conducted a retrospective survey with all the women who delivered six months prior to the intervention to obtain baseline data.

During the intervention phase, four case villages and six control villages were selected. Case villages were subdivided into two bicycle ambulance villages and two community transport plan villages. The latter involved one village selecting a traditional method which included a home made stretcher, and another using a hired ordinary bicycle. All obstetric cases were documented and timed, and the mode of transport that had been used was recorded.

Each Research Assistant in the study village, and each health centre nurse/midwife were given stopwatches for recording departure and arrival times of patients in their respective registers.

Consultative meetings were held in all case and control villages to determine financial schemes for maintenance of the modes of transport. A financial committee was established in each site to maintain expenditure of community funds.

In villages with bicycle ambulances, an average of MK300 was collected and used to replace tubes, tyres and broken spokes and to support other maintenance costs. Villages with CTPs decided to charge a flat rate of MK10 per health centre trip to compensate for the hired bicycles and stretcher carriers fees. The control villages had no financial scheme put in place as the community decided patients should pay according to the mode of transport they selected. A careful record of all expenditure was kept by the village chiefs.

The villager's out of pocket costs to maintain bicycle ambulances and for hiring bicycles and fees for stretcher carriers as established transport plans and number of institutional deliveries in case villages were used to calculate the cost per institutional delivery. Quantitative data from village and health centre registers were verified, coded and entered into the computer. Results were analysed using Epi Info version 6 statistical package. An iterative process was used to analyse qualitative data.

Ethical clearance for the study was obtained from the National Health Sciences Research Committee and verbal

consent from the community respondents prior to onset of focus group discussions and interviews.

## Results

A total of 157 women delivered during the intervention phase. However, 27 of these women were lost to follow up. Of the remaining 130, a total of 89 women (69%) delivered in a health facility and therefore experienced some form of transportation. Of these institutional deliveries, 20 (22%) were from case villages provided with bicycle ambulances; 32 (36%) from case villages with established transport plans and 37 (42%) were from the control villages. Table 1 presents the distribution of deliveries in the three village categories and site of delivery.

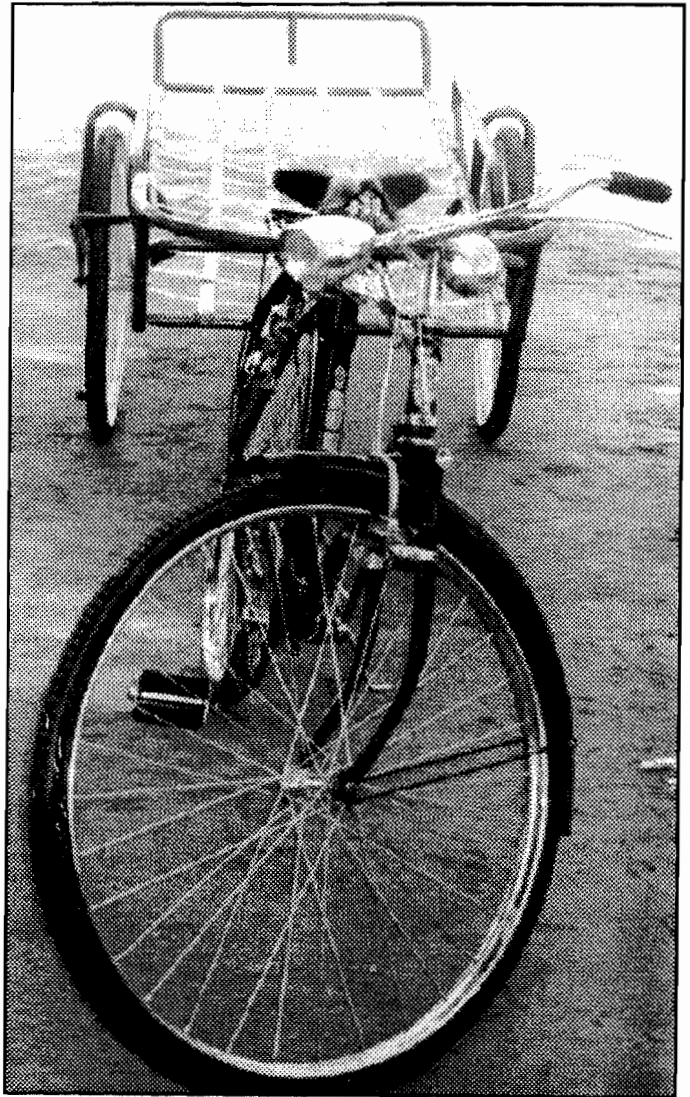


Table 1: Distribution of deliveries by village category and delivery site

Village category	Delivery site		
	Home	Institutional	TOTAL
1. with Bicycle Ambulance (Case)	21	20	41
2. with Community Transport Plan (Case)	4	32	36
3. with neither BA nor CTP (Control)	16	37	53
<b>TOTAL</b>	<b>41</b>	<b>89</b>	<b>130</b>

In villages provided with bicycle ambulances, a total of twenty referrals were transported to the health facilities on bicycle ambulances. Only 4 (20%) of these referrals were for obstetric reasons. The majority (80%) were general medical cases which included those with fractures and cholera.

### **Time and cost-effectiveness**

There was negligible variation in mean time for transport between all three groups. Approximately 90 minutes was required for travel with all forms of transport studied.

The majority of women (61%) transported in all the study villages preferred to walk to the health facility for their deliveries.

The cost effectiveness was estimated at MK15 per institutional delivery when bicycle ambulances were used while community transport plans cost MK0.30 per institutional delivery and control villages paid nothing\*

\* The expenditure in control villages was nil as 57% chose to walk and the remaining women (43%) used their own family bicycle or a relative's bicycle free of charge.

### **Cultural acceptability**

We found that important cultural beliefs existed in this study population which deter most pregnant women from using the bicycle ambulances. It is believed that publicising the onset of labour summons evil spirits causing obstructed labour with potential death to mother and child, as illustrated by this quote from a female respondent in rural Nsanje district who said:

*“Here, if people see you going to the hospital for a delivery, they can bewitch you.”*

### **Home deliveries**

During the intervention period, home delivery rates in bicycle ambulance and community transport plan villages were 51.2% and 9.8%, respectively. The rate in control villages was 39%. Abrupt onset of labour was the major reason given for having a home delivery.

### **Discussion**

In this study we were unable to demonstrate that either bicycle ambulances or community transport plans were effective in strengthening obstetric referral systems in the study area. There appears to be no improvement in the time taken to reach a health facility with all forms of transport studied.

Approximately 90 minutes was required for travel which correlated with independent studies indicating that more than 60% of women wait longer than 2 hours for transport [2].

In case villages where villagers were contributing toward the maintenance of the bicycle ambulances, these may have introduced additional charges for them without perceived benefit. Significantly, walking was still the preferred mode of transport in all the villages and this contributed to the extremely low cost per institutional delivery shown in the study. This agrees with previous studies which indicated that 69% of women walk irrespective of the severity of their obstetric

condition [2]

The study has also shown that BAs are not culturally acceptable for obstetric referrals. Deep cultural beliefs deterred most pregnant women from using the transport interventions introduced. This was a concern voiced post intervention but was not mentioned pre-intervention. In all post intervention focus groups, the issue only came to the surface upon probing for reasons for the low utilisation of the BAs. This gives some indication of why 80% of transportations made on bicycle ambulances were for non obstetric cases such as fractures and cholera. This also explains why the majority of women (61%) in the study villages preferred walking to other forms of transport.

Comparing pre-intervention and intervention phases, home delivery rates in case villages decreased from 37% to 18%. However, during the intervention period a comparison between case villages and controls was inconclusive. Higher home delivery rates were noted in cases villages provided with BAs and a lower home delivery rate in case villages with established CTPs. However, these differences were of dubious statistical significance ( $p < 0.04$ ). A comparison of home delivery rates between cases villages only (BAs and CTPs) showed a significant difference ( $p < 0.0001$ ). CTPs did appear to decrease home delivery rates more than bicycle ambulances.

Overall, however, the present study has provided inconclusive evidence on changes to home delivery rates, requiring further investigation.

### **Conclusions**

This community-based study casts doubt on the utility of bicycle ambulances for an obstetric population. Deep cultural belief systems exist which need to be thoroughly investigated before introducing an intervention based on little evidence.

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