

# Women's involvement in household decision-making and strengthening social capital—crucial factors for child survival in Ethiopia

Mesganaw Fantahun (mesganaw\_f@yahoo.com)<sup>1,2</sup>, Yemane Berhane<sup>1,2</sup>, Stig Wall<sup>2</sup>, Peter Byass<sup>2</sup>, Ulf Högberg<sup>2,3</sup>

1. Department of Community Health, Addis Ababa University, PO Box 24762, Code 1000 Addis Ababa University, Addis Ababa, Ethiopia

2. Umeå International School of Public Health, Epidemiology and Public Health Sciences, Department of Public Health and Clinical Medicine, Umeå, Sweden

3. Obstetrics & Gynaecology, Department of Clinical Sciences, Umeå University, Umeå, Sweden

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## Correspondence

Dr. Mesganaw Fantahun, M.D., M.P.H., Department of community health, Addis Ababa University, PO Box 24762, Code 1000 Addis Ababa University, Addis Ababa, Ethiopia.

Tel: 251-1-157701 |

Email: mesganaw\_f@yahoo.com

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## Abstract

**Aims:** To assess the influence of household decision making, social capital, socio-economic factors and health service use on under-five mortality.

**Setting:** Butajira Demographic Surveillance Site, Ethiopia.

**Methods:** A prospective case-referent design with a total of 209 under-five year old deaths occurring in an 18-month period, together with 627 referents matched for age, sex and community of residence were included. Questionnaires were administered to mothers or caretakers. Matched case control analysis investigated the effect of risk factors on mortality and the presence of avoidable factors was assessed for each death.

**Results:** Lack of immunization was strongly associated with mortality (adjusted OR = 9.8, 95% CI 5.9, 16.1). Low decision making capacity of women (adjusted OR = 3.2, 95% CI 2.0, 5.0) and low social capital scores (adjusted OR = 1.9, 95% CI 1.1, 3.5) were also related to high under-five mortality in multivariate analyses. Potentially avoidable household and health facility factors were identified, respectively in 71% and 40% of the deaths.

**Conclusion:** Combined efforts to improve women's involvement in household decision making, social capital and immunization may decrease the high child mortality in this setting where the level of poverty is high and no appreciable trend in child mortality decline has been noted over the years.

## INTRODUCTION

Although an increasing number of countries have succeeded in improving the health and well being of mothers and children, some countries with the highest burden of mortality made little progress during the 1990s (1). More than 10 million children die each year, most from preventable causes and almost all in poor countries, but the causes of death may differ from one country to another (2). The fourth Millennium Development Goal of reducing under-five mortality rate by two-thirds until 2015 is far away in many countries in Africa.

Household decision making may be protective for child mortality as a result of behavioural changes following improved health knowledge and care, and increased use of health services (3). According to Kabeer's dimensions of empowerment [resources (or preconditions), agency (or process) and achievements (or outcomes)], decision making has generally been considered as an agency of empowerment, but may also be an outcome, indicating its key place in the concept of empowerment (4).

Social capital, relationships and norms that shape the quality and quantity of a society's social interactions, is considered not only as just protective against the impact

of poverty, but also an important independent predictor of child health (5). Several studies have documented the effect of immunization on child mortality (6,7). Other variables such as illiteracy and low economic status have also been associated with high child mortality (8,9).

The concept of avoidability of deaths implies that with a different measure or management a death could have been averted, i.e. the concept in broad perspective can be used both at a community and individual level and include factors such as patient's delay in recognizing and seeking care and health worker's delay of diagnosis, suboptimal care and the like. It was introduced to identify negative indicators based on unnecessary episodes of disease, disabilities and untimely deaths, as part of the whole chain of possible unfortunate factors on the road to death (10). However, most studies on avoidability were done in developed countries (11). Exceptions are studies on avoidable maternal deaths in low-income countries. A study in Zambia identified avoidable factors at patient/community, local health facility and at tertiary hospital levels and reported that delay in seeking and suboptimal cares were the most common avoidable factors (12). In another study in Tanzania, actions on identified avoidable factors achieved a significant decrease in maternal mortality (13).

Previous studies from the Butajira Demographic Surveillance Site (DSS) in Ethiopia, more than a decade and half ago, identified such factors as paternal illiteracy, not being in the committee of the people's organization and absence of windows as affecting under-five mortality (14). On the other hand, a cohort study for the years 1987–2001 reported that under-five mortality did not show any appreciable downward trend in 15 years (15). Thus, it is important to assess the prevailing causes of child mortality by including potential factors that were not considered by previous studies such as household decision making and social capital. An adapted conceptual framework from Millard (16), and Pena et al (17) on determinants of under-five mortality (Fig. 1) was used to assess the relationship of under-five mortality with all possible factors while giving particular attention to those factors that were not explored earlier. The model used by Millard and Pena et al consisted of three tiers: ultimate, intermediate and proximate factors. Ultimate factors could act at different levels including community and household situations, intermediate levels were related to health care and reproductive issues, while proximate determinants dealt with the medical causes of death that were classified as potentially avoidable and possibly unavoidable. Pena's model was restricted to infant deaths and the study mainly dealt with intermediate determinants (17).

The aim of this study is to assess whether women's involvement in household decision making and social capital are related to reduced under-five mortality in rural Ethiopia and determine the influence of other potential ultimate and intermediate factors contributing to under-five mortality.

## METHODS

### Study setting

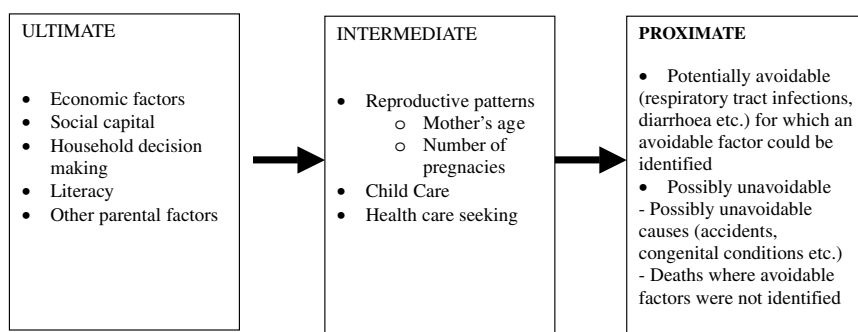
The study was conducted in Butajira DSS in Ethiopia where data collection on vital events and related research has been going on for the last 18 years (18). Ethiopia has some of the worst health and economic indicators. The per capita income is about 110 USD and the country has one of the highest under-five mortality rates of 166 per 1000 live births. Life expectancy at birth is about 48 years (19). The study area approximates to the national average for economic and health status indicators. The DSS site includes a total of around

43,000 people and includes nine rural and one urban communities. The rural lowland areas are drought prone and have been affected during major droughts in Ethiopia. Current under-five mortality was estimated to be 131 per 1000 live births in the study area. Earlier studies documented an under-five mortality rate of 166 per 1000 live births in the study area and the population has grown at an average of 2.7% (18). Life expectancy at birth was estimated at 50 years. The study area and population are described in detail elsewhere (18).

There are a district hospital and a health centre in the study district. In addition, eleven low level private clinics and eight community health posts render health services to the study population. The health posts were established as part of the DSS intervention activities. The hospital was established 4 years back with the contribution of the community and outside aid. The hospital and the health centre provide both curative and preventive services such as expanded program of immunization (EPI), antenatal care, and delivery care. Diseases that are prevented by the EPI are tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus and measles. The hospital in addition renders surgical and emergency obstetric care services. The low level private clinics provide mainly non-surgical uncomplicated curative services and are staffed either by health assistants or nurses. Community health posts staffed by community health agents provide health education, serve as outreach services for EPI and treat some childhood illnesses such as uncomplicated malaria and pneumonia using only oral medications. Immunization services are provided daily except in community health posts where they may be provided weekly or monthly. Government health institutions and community health posts generally offer free child health services. However, patients may have expenses, such as buying drugs which are not available in the health institution, and indirect costs such as transportation.

### Study design

This was a prospective case referent (control) study. Deaths among under-fives that occurred in an 18-month period (August 1, 2003 to January 31, 2005) were included in the study prospectively. For every case three referents were randomly selected matched for age, sex and community of residence. For all infant deaths (under one year old), the



**Figure 1** Conceptual framework for assessing risk factors for under-five mortality.

referents were infants (under 1 year old) who were alive at the time of the study but older than the deceased. For ages at deaths 1–4 years, the referents were children in the same age group, but older than the deceased. An average of 12–15 under-five deaths were expected per month. The study instrument included a verbal autopsy (VA) questionnaire for the cases. The VA instrument was developed based on WHO/INDEPTH questionnaires (20).

For assessing risk factors another set of questionnaires was administered to the mothers or caretakers of the cases and referents based on the conceptual framework mentioned earlier (Fig. 1).

The questionnaires, in addition to risk factors, included variables that would allow identifying avoidable factors among the deceased. The latter included household avoidable factors and health service avoidable factors as defined below. Questionnaires were first prepared in Amharic, the Ethiopian national language, and translated into English by two public health experts with good knowledge of both languages and then back-translated to Amharic.

Measurement of household economic status is a difficult task in less developed countries as income assessments are rarely reliable and thus wealth assets have been used as better indicators (21,22). However, the list of items used to measure economic status differed among study populations in order to suit the particular conditions of the study area. The Ethiopian Demographic and Health Survey of 2000 indicated a list of items used to measure wealth assets and documented the assets commonly found in urban and rural areas while not explicitly recommending a list for national use (23). These items were considered in the development of economic status indicator in this study and items that are useful for the study area were identified through Focus Group Discussions (FGDs). For the assessment of social capital, the World Bank's social capital core indicators (24) were used, but they needed to be adapted to the local situation. Thus exploratory FGDs were conducted to develop appropriate questions for assessing the economic status of households and social capital measurement. A total of 12 FGDs were conducted which consisted of two women's and two men's groups in each of the three residence strata (rural lowland, rural highland and urban). Each group consisted of 6–8 people. Eighty-three people participated of which about four-fifth were married. FGD participants were selected with the help of community leaders and the criteria used to select the participants were age 20 years and above, people knowledgeable about the lives, economic, social and health conditions of the population and subpopulation groups (men, women, youth, etc.), who had lived in the area for more than 2 years and who were able to freely and genuinely express their own and the community's views. The method of analysis used in this study was Content Analysis. The discussions were tape-recorded and transcribed verbatim. Reading several times the transcriptions, codes were made and refined focusing on type of household decision-making, what assets (items) indicate economic status, which social capital items are important and how they rate them. Then conclusions were drawn on ways of assessing and measuring the main

variables of the study. The results of the FGD were used to adapt the study instrument to the local situation and further to score household decision making and economic status. Regarding economic status, urban and rural FGD discussants classified people into economic classes by considering possession of certain items and gave scores of 4, 3 and 2 or 0 for better-off, average and low status, respectively (Table S1).

Then a composite variable of economic status was created. The composite score was classified in to two categories. The lowest quartile scores were categorized as low and the rest as better.

Social capital scores consisted of the ability to borrow money in case of need, membership of the *Kebele* (smallest administrative unit) leadership, membership of community organizations, trusting people, thinking that people can hurt; each of which was coded as 1 when answered positively and 0 when answered negatively, except the response for 'people can hurt' for which the reverse was coded. The maximum score was 5, categorized into three equal categories as 0–1 low, 2–3 average and 4–5 good. Not all variables in the WHO core questionnaire were included in this study. Some were not considered useful for the study area by FGD participants. According to the FGD participants, answers to some issues related to political actions, such as trust or nontrust of politicians, were considered unreliable, could possibly create a misunderstanding of the aims of the study and so were better avoided. Similarly some information and communication issues such as making telephone calls were considered rare events and not useful. On the other hand, the responses to some questions (e.g. on safety and crime) were homogenous (everybody feeling safe) and so were excluded from the analysis. The authors of the WHO social capital questionnaire have also indicated that not all listed questions are likely to be useful in all places and not every phrasing of a particular question is likely to be appropriate in every context (24). As many other variables were assessed in this study besides social capital components, including the whole of the WHO integrated social capital questionnaire would have made our questionnaire too lengthy. Hence, we considered only the WHO core social capital questions.

Household decision making scores were based on the responses to four decision making questions: who makes 'big decisions' (decisions to change place of residence, buy, sell or reconstruct a house, rent land, etc.); routine household decisions that include decisions on buying and selling food items and day-to-day activities in the household; decisions to visit family and friends; and decisions to take a sick family member to a health institution. The decision-making scores were initially categorized as decision only by the head (which was generally the husband), by spouse (mostly wife) and both husband and wife and other family members. Analysis of decision-making scores showed a higher proportion of childhood deaths when the husband alone decided. Wives alone decided in only 5% of the cases. Subsequently, decision making by the husband alone was given a 0 score and by both or the wife a 1 for all four variables and a summary

variable was created. A score of 0–2 was compared against a score of 3–4.

Household literacy status was classified as literate if either the mother or the father claimed that they could read and write and illiterate if both could not read or write.

All causes of deaths were classified according to the ICD-9 classification. Two physicians reviewed each VA form independently to assign one or two causes of death, and subsequently met to reach consensus for cases where there were differences.

All deaths were first classified as having resulted from potentially avoidable causes (e.g. respiratory tract infections, diarrhoea, etc.) or possibly unavoidable causes (accidents, congenital conditions, etc.) based on the assessment of the prevailing conditions in the study area (availability of mechanisms and resources) and the present capacity of the health system. Then potentially avoidable causes were assessed for the presence of avoidable factors, and were classified as avoidable or unavoidable by the two clinicians and the principal investigator, a community health expert with medical background (MF).

Once a cause was assessed as potentially avoidable, it was further classified for the presence or absence of household and health service factors as follows:

#### Household avoidable factors

- (1) No health care seeking
- (2) Delayed health care seeking
- (3) Seeking only traditional care
- (4) Lack of pre-natal care
- (5) Untrained delivery attendant
- (6) Not using the available prevention programme (eg Vaccination)
- (7) Problems related to feeding.
- (8) Not going to the referral institution.

#### Health service avoidable factors

- (1) Possible poor management or follow up
- (2) Possible poor management and/or referral
- (3) Lack of referral
- (4) Delayed referral.

Further, the following operational definitions were applied to identify avoidable factors. Delayed health seeking for symptoms of long-term diseases such as tuberculosis was considered when not seeking care for more than 14 days after the appearance of symptoms, while it was more than two days for acute problems such as pneumonia. Possible poor management or follow-up was considered if failure in prevention of complications, delay in treatment, inadequate diagnosis, inadequate treatment, delayed recognition of complications or failure of follow-up were identified. Possible poor management and/or referral was considered if there was agreement that the case could have been managed at a particular level of the health care system, but it appeared that health institutions involved (such as health posts, health centres or private health clinics) either did not handle the case properly or did not refer the patient when needed. Lack

of referral was entertained if the management of a case appeared clearly above the capabilities of a health institution, but the institution did not refer the patient. Untrained delivery was defined as having a home delivery where the birth attendant was untrained (or the training status of the attendant was not known). Lack of prenatal care was defined as not having at least one antenatal visit during pregnancy. It should be noted however that while the activities of the health system may influence 'household factors', we used the term 'health service factors', for those negative conditions that patients faced while visiting health institutions.

The questionnaires were piloted by retrospectively applying them to deaths that had occurred in the previous year and pretested before the final study, resulting in minor modifications.

#### Data collection

Five data collectors who had completed high school and had previous experience in community-based data collection administered the questionnaire to mothers or caretakers of the cases and referents. A supervisor coordinated the activities of the data collectors, oversaw the data collection process, checked the questionnaires for completeness and consistency and conducted random checks by re-interviewing about 5% of the respondents. Of those randomly checked questionnaires, inconsistencies were found in less than 1% of the cases.

Data were collected from 45 to 60 days after death in most cases. Forty-five days is considered as the usual mourning period in the study area. For 20 cases (9.6%) data collection took place between 3 and 4 months after death for operational reasons.

Data were entered and analysed using SPSS Version XI. Initially matched case-control bivariate analyses were conducted. Variables with significant associations were then included in a multivariate model for conditional logistic regression analysis. Odds ratios (95% confidence intervals) were used to assess the effect of risk factors on under-five and infant mortality.

This study was ethically approved by the National Ethical Clearance Committee as part of the BRHP research activities and individual informed consent was obtained from each participant.

## RESULTS

### Socio-demographic characteristics of the study population

A total of 240 under-five deaths were identified in the DSS database during the study period. Of these 209 (87%) were included in the study. Thus 627 referents were also recruited. Thirty-one deaths were not included due to late identification. Of the deaths 71 were neonatal, 73 postneonatal and 65 died in the age group 1–4 years. The infant mortality rate was 83 per 1000 and the under-five mortality rate was 131 per 1000 births.

A high proportion of children had illiterate mothers (85%) and many had illiterate fathers (53%). In about half of the

households both parents were illiterate. The majority, (58%) of the mothers had had 2–5 pregnancies. A high percentage of the houses, 70% of the cases and 62% of the referents, did not have windows.

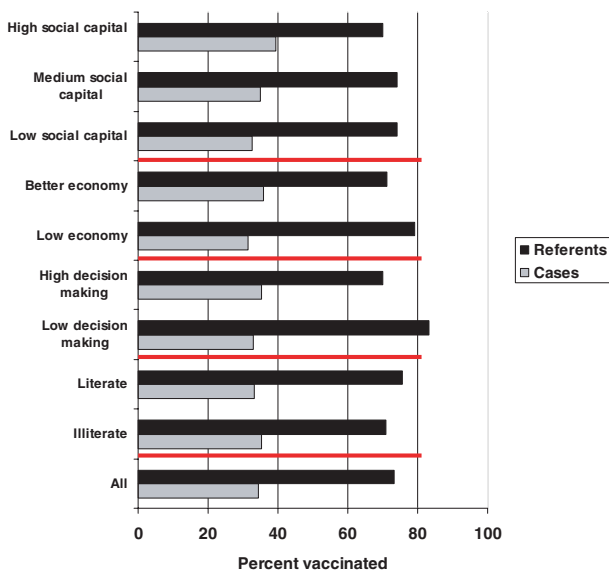
**Causes of under-five mortality**

The most common causes of deaths as identified by physicians' review were pneumonia (28.5%), diarrhoeal diseases (23.2%), perinatal deaths (17.8%), malnutrition (15.7%) and meningitis (10.4%).

Table S2 shows the association of different factors with under-five mortality. Lack of immunization had a strong association with mortality in under-five children [adj OR 9.8 (6.0–16.1)] and infants [adj OR 26.2 (12.0–57.3)]. Mortality of children was about three times higher in families with low decision making scores compared to those with high decision making scores. Low social capital and low economic status were associated with higher under-five mortality compared with those better-off, but economic status did not maintain statistical significance when controlling for other factors. The impact of low social capital scores was higher for infants compared to all children

As shown in Figure 2, the proportion of vaccinated cases was higher for those with high decision making scores, high social capital, and better economic status. Conversely the proportion of vaccinated referents was higher for low decision making and social capital scores and low economic status.

First pregnancies, adolescent mothers and children with both parents illiterate had higher odds of dying, although the associations were not statistically significant when adjusted for other factors.



**Figure 2** Percentage distribution of cases (n = 209) and referents (n = 627) by vaccination status and potential determinants of childhood mortality in Butajira, Ethiopia. August 2003–July 2004.

**Household and health service avoidable factors**

Diagnoses were not established for eight cases by the physicians. Among those with established diagnosis, household avoidable factors were identified in 148 (70.8%) cases, whereas health service avoidable factors were identified in 40% of the cases.

The most common household avoidable factor was delayed health seeking (32.8%), followed by no health seeking at all (24.1%). Difficulty in finding means of transport, a community level factor, was reported by 49% of the respondents.

Possible poor management of patients and/or poor referral constituted about 71% of the health service avoidable factors. The major causes of death where health service avoidable factors were identified included pneumonia 31 (26.9%), diarrhoea 23 (20%), generalized infection/sepsis 18 (15.7%), malaria 13 (11.3%), and malnutrition 10 (8.7%).

In 102 (68.9%) cases a single potentially avoidable household factor was identified. In 36 (24.3%) and 10 (6.8%) deaths two and three avoidable household factors respectively were identified. With respect to health service avoidable factors, in 80 (95.1%) deaths a single factor was identified.

The distribution of potentially avoidable household and health facility factors is shown in Table S3.

The presence of household avoidable factors strengthened the association between under-five mortality and low decision-making scores [OR 5.00 (2.8–8.7)], and low social capital and economic status. The odds of mortality in the presence of household avoidable factors was higher by about 2.5 times in the low social capital category compared to the high social capital category. Having a teenage mother [OR 2.99(1.03, 8.73)] and the absence of windows [OR 2.1 (1.1, 4.4)] were significantly related to infant mortality in the presence of household avoidable factors.

**DISCUSSION**

Immunization of children, mother's age, household decision making, number of pregnancies, total social capital and economic status, absence of at least one literate parent and absence of windows had significant associations with under-five mortality in bivariate analyses. In the multivariate model, immunization status, household decision-making and social capital retained statistical significance, showing the importance of these factors beyond that of being related to each other.

Thus, among the ultimate factors, household decision making and social capital had the strongest influence, with economic status and literacy contributing to a lesser extent. Among the intermediate factors, health care seeking (immunization, delayed or no health care seeking) had the strongest association with mortality. Compared to all children, children from households where avoidable household factors were identified were more likely to be affected by household decision making.

There is some potential for recall bias in this study as some of the interviews (10%) took place 3–4 months after the occurrence of the death. However, there was no appreciable

difference in the distributions of important determinants and causes of deaths between those who were interviewed around the two months period and later and studies have reported that mothers' recall over a six month period was similar to one month after death (25). The delay in identification, in addition to the drop out of interviewers was related to late reports of deaths by the DSS data collectors, who collected data on quarterly basis.

Another limitation of the study is that health service avoidable factors were not assessed by objective means such as observing health service activities, availability of equipment and the necessary skills in the health institutions and hence may undermine the occurrence of health service avoidable factors. In addition, health seeking factors labelled as household factors can be influenced by quality of health services and the extent of this influence is not known.

This study gave equal weight to all components of household decision making and social capital variables as there was no indication in the FGDs of differences in the importance of the components. If there are differences in the importance of the components, our findings may have underestimated or overestimated the association to a certain extent and this is another limitation that might be addressed by future studies. However, even if there were differences in importance, the direction of association would not change as the cases had lower scores than the referents in all components.

This study found that any level of women's involvement in decision making is related to reduction of under-five mortality. Some authors have indicated that different levels of involvement in decision making may have different empowerment outcomes and women may formally ascribe decision making to husbands while detailed investigations may suggest that women's involvement had occurred (4). While the latter may undermine the informal decision-making agency women exercise, it is unlikely to influence the association between decision-making and child mortality in this study. We elicited several aspects of household decision-making for which different answers were obtained and we have observed large and significant differences between the comparison groups. Nevertheless, further studies may need to be conducted to assess the degrees of women's involvement in decision-making and their effects. Economic status was assessed based on wealth assets used in the Ethiopian DHS 2000 and community representatives' opinion, in the absence of better alternatives in Ethiopia. As these tools were not validated, some errors in estimating the effect of economic status on mortality cannot be ruled out.

The difference between cases and referents with respect to immunization, particularly in infants, may be partly explained due to timing, as infant sickness and early deaths would give no opportunity for immunization. Thus the selection procedure of referents may have overestimated the odds for not being vaccinated. However, as child immunization should be completed at 9 months of age, this does not explain the large difference observed. Vaccine preventable diseases targeted by EPI were not identified among the common underlying causes of death in the study although they

may be related to some of the most common causes of death such as pneumonia and perinatal deaths. On the other hand, studies have reported that protective effects of measles vaccine can be much higher than would be expected from prevention of measles (6,7). Immunization could perhaps also reflect proxy health behaviour not captured by other variables. The differences in immunization among different decision making, social capital and economic status categories may also support this observation.

Mortality of children was about three times higher in families with low decision making scores compared to those from high decision making scores. Other studies have also reported the effect of household decision making on child survival (3,9). A survey in Ghana found that under-five mortality was 133 deaths per 1000 births among women who had no say in any household decisions compared with 104 deaths per 1000 births among women who had a say in all five household decisions (9). Women's empowering interventions have shown great impacts on women's quality of life, autonomy and authority, on policy changes, and on improved infant and child survival (3,26). Household decision making had a strong effect on child survival. The centrality of decision making within the concept of empowerment suggests that empowerment has effect on mortality, but further research may be needed to examine these issues in detail.

Low social capital had one of the strongest associations with under-five mortality and this effect was greater for infants. People with high social capital may have greater opportunities both for preventing illnesses and getting help during illness and hardships and it appears child/infant survivorship heavily depends on social relationships and interactions in such communities. The ability to borrow money and trust and other variables employed in this study to measure social capital appear enabling instances in case of needs. The importance of these factors has been elucidated by review of several studies (27). Low social capital has often been associated with poverty and social deprivation, but studies have shown an independent impact of social capital on health (5). Most studies on social capital in relation to health have been done among adults. Aggregated individual data have been used to show that aspects of the community social capital are determinants of both perceived health and mortality (28). The few studies on children reported association of low social capital and ill health and death (5,29).

The findings of this study with regard to household decision making/empowerment and social capital may have important implications for similar settings where poverty and illiteracy prevail. Measures targeted towards changes in household decision-making and/or social capital may achieve a high rate of decrease in child mortality even if other changes (economic, educational status) are slow.

However, definitions and measurements of these concepts remain debatable and context specific, making interpretation and comparison difficult. Further work may be needed to standardise definitions and measurements.

It is interesting to note that the presence of household avoidable factors strengthened the association between

under-five mortality and low decision making and low social capital. This finding has practical importance as changes in these factors imply a decline in child mortality despite prevailing situations. Dealing with those situations considered potentially unavoidable at present on the other hand would need more investments in development and health infrastructure and thus demand more time and resources.

Children of teenage mothers and first born appeared more likely to die compared to those born to older women, particularly those for whom avoidable factors were identified, and this may be associated with mothers' capacity and experience to care, as also reported in other studies (30). Thus postponing childbirth and/or marriage until the age of 20 and beyond is important to improve child survival.

Although family economic status was a risk factor it was not as strong as the other factors. One reason may be the general low economic status with small differences in the study population. Several of the factors mentioned as signs of better economic status in the FGD were reported rarely or not at all at the time of data collection. In addition, under-reporting of household possessions cannot be excluded although much effort was made to convince respondents about the purpose of the study and its independence from fiscal matters, to minimise underreporting.

It was difficult to assess the effect of mother's literacy on child mortality due to prevailing high maternal illiteracy. Similarly it was difficult to analyse mortality by educational level. However, associations between mothers' educational status and child mortality has been reported in several studies from low-income countries where maternal education was more heterogeneously distributed (20,30).

Absence of windows in houses appeared to be related to childhood death in this study, particularly in those for whom avoidable factors were identified. A previous study in Butajira also documented an association between under-five mortality and the absence of windows (14), although current estimates of the strength of association are weaker. This association could be related to indoor air pollution (14). Similarly the association of mortality with factors that were important in the study conducted 15 years ago (such as paternal literacy) was weaker in this study. A separate study may address the reasons for these differences.

Delayed health care seeking or not seeking care at all were the most important household factors identified in under-five deaths. This is similar to findings of studies on avoidable factors for maternal mortality (12,13).

Possible poor management, follow up and referral are major health service avoidable factors and call for improvement in the health system by training health workers including private and community health workers and conducting supportive supervision.

Community level factors, except lack of transport, were not assessed in this study. Likewise, this study did not assess in detail health facility level factors and their influence and interactions with household factors. Factors labelled as household related could rather be the results of the influence of health service factors. These issues are important in improving childhood mortality and need to be explored further.

In conclusion, combined efforts to improve women's involvement in household decision making, social capital, improved health seeking in general and immunization in particular may decrease the high child mortality in this setting where level of poverty is high and no appreciable trend in child mortality decline has been noted over the years.

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### Supplementary material

The following supplementary material is available for this article:

**Table S1** Community classification of economic status of families in rural and urban areas of Butajira and allocated economic scores. August 2003–July 2004

**Table S2** Association of variables with under-five years mortality in Butajira, Ethiopia, August 2003–July 2004

**Table S3** Types of household and health facility avoidable factors\* in under-five children deaths (n = 209) in Butajira, Ethiopia, August 2003–July 2004

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