

# Access to health care and mortality of children under 5 years of age in the Gambia: a case–control study

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**Objective** To assess whether traditional measures of access to health care (distance and travel time to a facility) and non-traditional measures (social and financial support indicators) are associated with mortality among children under 5 years of age in the Gambia.

**Methods** We conducted a case–control study in a population under demographic surveillance. Cases ( $n = 140$ ) were children under 5 years of age who died between 31 December 2003 and 30 April 2006. Each case was matched in age and sex to five controls ( $n = 700$ ). Information was gathered by interviewing primary caregivers. The data were analysed using conditional logistic regression.

**Findings** Of traditional measures of access, only rural versus urban/periurban residence was important: children from rural areas were more likely to die (OR: 4.9; 95% confidence interval, CI: 1.2–20.2). For non-traditional measures, children were more likely to die if their primary caregivers lacked help with meal preparation (OR: 2.3; 95% CI: 1.2–4.1), had no one to relax with (OR: 1.8; 95% CI: 1.1–2.9), had no one who could offer good advice (OR: 23.1; 95% CI: 4.3–123.4), had little say over how earned money was spent (OR: 12.7; 95% CI: 1.3–127.6), were unable to cut spending for health care (OR: 2.5; 95% CI: 1.5–4.2) or had to carry out odd jobs to pay for the care (OR: 3.4; 95% CI: 2.1–5.5). A protective effect was observed when the caregiver had other children to care for (OR: 0.2; 95% CI: 0.1–0.5).

**Conclusion** Improving access to health-care for children in the Gambia and similar settings is not simply a matter of reducing travel time and distance to a health facility, but requires improvements in caregivers' support networks and their access to the financial resources they need.

Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

## Introduction

Every year approximately 10 million children under 5 years of age die throughout the world, mostly in developing countries.<sup>1</sup> Of every 1000 children born in sub-Saharan Africa, approximately 170 die, compared with less than 10 of those who are born in developed countries.<sup>2</sup> The fourth Millennium Development Goal is to reduce child and infant mortality in the world by two-thirds by 2015,<sup>2</sup> yet current estimates suggest that at least 44 developing countries have less than a 20% chance of achieving the goal.<sup>1</sup> An understanding of the risk factors associated with child mortality and the design of appropriate interventions are urgently required.

Population-based studies suggest that poor access to health care, which results in delayed attendance at a health facility or none at all, may be a key determinant of mortality in children under 5 years of age in developing countries.<sup>3,4</sup> To assess this relationship, researchers have adopted simple traditional measures, such as distance from the household to a health facility,<sup>5–7</sup> availability of transportation<sup>8</sup> and health-care costs.<sup>9</sup> Their findings have been inconclusive. Recently, qualitative studies<sup>10–12</sup> have suggested the need to consider additional barriers, such as lack of social support for primary caregivers, limited caregiver autonomy in decision-making

and financial matters, and social exclusion at health clinics. Studies that assess the relationship between these factors and child death are needed. Therefore, we evaluated traditional measures of access to health care in addition to non-traditional measures to study mortality in children under 5 years of age in the Gambia.

## Methodology

### Population and study design

We conducted a case-control study within the Farafenni Demographic Surveillance System (FDSS), on the North Bank of the River Gambia. The FDSS was established in 1981 as a platform for research, its location being considered particularly ideal for malaria studies. The FDSS covers approximately 17 000 rural and 26 000 urban dwellers belonging to three main ethnic groups (Wollo, Mandinka and Fula) among which young age, high fertility, low educational levels, frequent polygamy and widespread poverty prevail.<sup>13</sup> Water is gathered primarily from communal wells with hand pumps, and 12% of the population utilizes uncovered wells. Pit latrines predominate. Villages have no electricity, and transportation routes are dirt roads.<sup>13</sup>

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e cases were all children under 5 years of age under coverage by the FDSS who had died between 31 December 2003 and 30 April 2006. Children were excluded from the study if their primary caregiver could not be located or had since died or if their cause of death was unrelated to access to health care (e.g. congenital malformations, in-hospital neonatal deaths, immediate death after an injury, etc.). Verbal autopsies, available for 92% of the cases, were conducted within 3 months of death by trained field workers using the standardized INDEPTH form, as part of routine FDSS practice.<sup>14</sup> They were assessed by consensus between two physicians.

Controls were children under 5 years of age who were registered in the FDSS and who were alive at the time their respective cases died. They were excluded from the study if the primary caregiver could not be located or had since died. From the FDSS population, 10 controls were randomly identified for and matched with each case by age (within the same birth month) and sex. Only the first five random choices were selected, followed by the next child on the list of random choices in the event of refusal to participate.

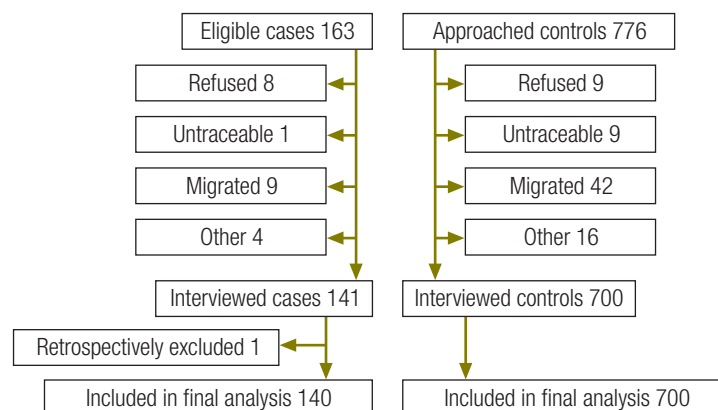
On the assumption that 70% of the controls would take at least 30 minutes or more to travel to a health-care facility, we estimated that at least 120 cases and 600 controls were required to detect an odds ratio (OR) of 2.0 for less than or more than 30 minutes of travel time as a binary variable at a power of 80% and an alpha level of 0.05.

### Data collection

After written informed consent was obtained from primary caregivers, data were collected from them in their native language between 11 May 2006 and 25 October 2006. Interviews were conducted, whenever possible in private locations, by six trained and experienced Gambian fieldworkers who were familiar with the area and local languages.

The questionnaire had seven sections: (i) demographic characteristics; (ii) child characteristics (such as ethnicity); (iii) child health; (iv) household features, including amenities and wealth; (v) social support; (vi) health-seeking behaviour and (vii) traditional measures of access to health care. A household crowding index was adopted

Fig. 1. Case and control recruitment process, May–October 2006, for study conducted in the FDSS, the Gambia



FDSS, Farafenni demographic surveillance system.

from a previous Gambian study.<sup>15</sup> Social and financial questions relevant to accessing health care were identified and refined through a literature review that yielded 11 social support questions from a medical outcomes study<sup>16</sup> plus social<sup>17–20</sup> and economic<sup>5,21–24</sup> questions from previous studies in the Gambia and elsewhere. These were refined following focus group discussions, two rounds of piloting and expert review. The focus groups were composed of mothers with children from three villages. The mothers of identified cases were excluded. The reference date for each control interview was the day on which the control was the same age as the case child upon death. Personal prompts in relation to the reference dates were developed using an Islamic calendar and significant village-specific events.

To determine which health centres were appropriate and should be used to calculate distance and time from the households, we ascertained when each centre was established, whether it had the capacity to treat a seriously ill child, and what vaccinations and essential medications it had in stock. Respondents were allocated to the nearest centre considered appropriate.

Our choice took precedence if it differed from the facility assigned. Using a hand-held global positioning system (Garmin GPS 12 Personal Navigator®), we calculated the distance to each health centre from the centre of each village and the 45 periurban suburbs. Travel time was calculated by replicating the mode of travel each respondent used:

walking, horse or donkey cart, bush taxi (van to transport 20 to 30 people), private taxi or car. Transportation costs were obtained from taxi station attendants and respondents.

### Data management and analysis

Completed questionnaires were checked immediately and queries were resolved. Available demographic data were extracted from the FDSS database and cross-checked with hard copy questionnaires. Other data from the questionnaires were double entered into a database, verified and analysed using Stata software version 8.0 (Stata Corp, College Station, TX, United States of America). ORs were derived using conditional logistic regression. Confounding factors, in addition to variables felt to be related to access to health care, were incorporated into the questionnaire based on a review of relevant literature and on considerations of plausibility. Such factors included demographic characteristics, breastfeeding history, vaccination status and vitamin A supplementation status.

These were considered for inclusion in multivariate models using the change in estimate methodology.<sup>25</sup> For each variable, possible confounders were entered singly into a multivariable model. Any variable that caused the crude OR to change by more than 10%, or that made a non-significant result become significant, were selected for the final multivariate model. We applied the likelihood ratio test to detect interactions between variables. Correlation coefficients were calculated separately for social and financial variables.

the Joint Government of the Gambia/Medical Research Council Ethics Committee approved the study.

## Results

We recruited 141 of 163 possible cases (Fig. 1). One case was later retrospectively excluded because the death bore no relation to health-care access. We approached 776 randomly selected controls to yield 700 for interview (Fig. 1); 76 were the second choice, and 4 were the third choice. Refusal rates were less than 5%. The child's mother was the primary caregiver for 135 (96.4%) cases and 690 (98.6%) controls. The mean age of mothers of case children (28 years; range: 16–50) did not differ significantly from that of control children's mothers. Cases and controls did not differ significantly in either ethnicity or primary caregiver's educational level.

Sixty nine (49.3%) cases died before the age of 1 year (Table 1), and more than half the deaths occurred at home (52.9%). The commonest causes of death were fever of unknown origin (23.3%) and diarrhoea (20.2%). The terminal illness lasted less than a week in the majority of cases (84.3%), and 89.3% of the children were seen at a government health facility.

A longer distance to travel (more than 3 km) and higher costs to reach the health facility (more than 5 dalasi; 1 US dollar = 30 dalasi) were significantly associated with child death in univariate analyses (Table 2). However, after controlling for possible confounding factors (referenced at the bottom of each table), only place of residence retained significance: rural dwellers had a significantly greater likelihood of death than urban dwellers (OR: 4.9; 95% confidence interval, CI: 1.2–20.2).

In contrast, 10 non-traditional measures of access to health care were significantly associated with child death after controlling for confounders (Table 3 and Table 4). These included measures of primary caregiver social support: not having someone to relax with (OR: 1.8; 95% CI: 1.1–2.9); not having someone else to prepare meals (OR: 2.3; 95% CI: 1.2–4.1); not participating in social groups (OR: 3.6; 95% CI: 1.9–6.9); and not knowing anyone who could provide good advice in a crisis situation (OR: 23.1; 95% CI: 4.3–123.4). Surprisingly, not having someone who showed caring and kindness to the caregiver was

Table 1. Characteristics of children under 5 years of age who died in the FDSS, the Gambia, between 31 December 2003 and 30 April 2006

Characteristic	No. (%)
<b>Age of child at death, in months</b>	
0–6	40 (28.6)
7–12	29 (20.7)
13–24	31 (22.1)
25–60	40 (28.6)
<b>Cause of death (n = 129)</b>	
Fever of unknown origin	30 (23.3)
Diarrhoea	26 (20.2)
Pneumonia	15 (11.6)
Meningitis or cerebral malaria	17 (13.2)
Neonatal sepsis	6 (4.7)
Vomiting	3 (2.3)
Non-specific/other	32 (24.8)
<b>Place of death</b>	
Hospital	45 (32.1)
Health centre	13 (9.3)
Home	74 (52.9)
Other	8 (5.7)
<b>Duration of illness, in days</b>	
1–2	76 (54.3)
3–7	42 (30.0)
8–14	10 (7.1)
15–30	6 (4.3)
> 31	6 (4.3)
<b>Highest level of treatment received for illness</b>	
Health centre	60 (42.9)
Hospital	65 (46.4)
Village health worker	5 (3.6)
Traditional healer/marabout	5 (3.6)
Private physician/pharmacist/drug shop keeper	4 (2.9)
Unknown	1 (0.7)

FDSS, Farafenni demographic surveillance system.

protective against child death (OR: 0.4; 95% CI: 0.2–0.9). Moderately strong correlations ( $r = 0.60$ – $0.69$ ) were found between each of the following: having someone to talk with, having someone to relax with, having someone who understood your problems and having someone who showed caring and kindness. Also, having someone to help with domestic duties and having someone to prepare meals were moderately correlated with each other ( $r = 0.6$ ).

Children whose primary caregivers had little say over how money was spent (Table 4) were at increased risk of dying compared with those whose caregivers could always decide (OR: 12.7; 95% CI: 1.3–127.6). Children whose primary caregivers could not cut back on spending for health care were at greater risk of dying (OR: 2.5; 95% CI: 1.5–4.2). The

same was true of children whose primary caregivers had to do odd jobs to generate money for health care (OR: 3.4; 95% CI: 2.1–5.5). Measures of correlation between financial variables were not greater than  $r = 0.3$  for any comparison. Two significant interactions were identified: for children whose caregivers were unable to cut back on health-care spending but could use their savings to pay for health care, the OR for child death was 0.2 (95% CI: 0.1–0.9) as opposed to 5.3 (95% CI: 2.4–11.5) for children whose caregivers were unable to cut back on health-care spending or to use their savings for this purpose; rural children whose caregivers did not have an outside source of money to pay for health care had an OR for child death of 2.1 (95% CI: 1.2–2.7) when compared with urban children (OR: 1.0; 95% CI: 0.5–1.8).

With respect to time availability, children whose primary caregivers cared for other children were less likely to die than those whose primary caregivers cared for no other children, regardless of the number of children cared for: (1–3 other children: OR: 0.2; 95% CI: 0.1–0.5; 4 or more other children: OR: 0.2; 95% CI: 0.1–0.4).

## Discussion

### Major findings

After controlling for possible confounders, a rural place of residence was significantly associated with an increased risk of death before the age of 5 years, but no other traditional measure of access to health care retained statistical significance. However, 10 additional, non-traditional variables, including indicators of social support for the primary caregiver, his/her degree of financial autonomy and his/her source of revenue for health-care expenses, were significantly associated with child death.

These findings have important implications for the design of new interventions against child death in the Gambia and other developing countries and present new avenues for further research.

### Comparison with other studies

The increased risk of death in rural dwellers was not explained by a longer physical distance to a health care facility. It may be that rural dwellers simply take longer to seek appropriate help. In Malawi, rural residence was significantly associated with an increased risk of late medical treatment,<sup>26</sup> while in a multi-country analysis of sub-Saharan African countries, sick urban children were more likely to visit a health facility than rural children.<sup>27</sup> The lack of a significant association in our study between distance to a health care facility and child death is consistent with the results of studies performed elsewhere in Africa: non-significant increases in the risk of child death in association with increasing distance to health care were reported from Burkina Faso<sup>6</sup> and the northern Democratic Republic of the Congo.<sup>7</sup> This suggests that in such settings, physical distance to a health facility has little effect on access to health care.

The importance of social support in relation to access to health care has been proposed through qualitative research in Chad,<sup>11</sup> the Gambia,<sup>18</sup>

Table 2. Association between traditional indicators of access to health care and mortality in children under 5 years of age, FDSS, the Gambia

Variable	Cases No. (%)	Controls No. (%)	Crude OR (95% CI)	Adjusted OR (95% CI)
<b>Location of residence</b>				
Urban/peri-urban	57 (40.7)	386 (55.1)	1.0	1.0
Rural	83 (59.3)	314 (44.9)	1.8 (1.2–2.6)	4.9 (1.2–20.2) <sup>a</sup>
<b>Distance to health centre, in km</b>				
0–3	62 (44.3)	400 (57.1)	1.0	1.0
> 3 to 6	57 (40.7)	214 (30.6)	1.7 (1.2–2.6)	1.2 (0.5–2.6)
> 6	21 (15.0)	86 (12.3)	1.6 (0.9–2.8)	1.8 (0.6–5.6) <sup>b</sup>
<b>Distance, in km, and travel time, in minutes, index</b>				
< 3 km and < 30 min	51 (36.4)	328 (46.9)	1.0	1.0
> 3 km and < 30 min or < 3 km and > 30 min	33 (23.6)	142 (20.3)	1.5 (0.9–2.4)	1.2 (0.7–2.1)
> 3 km and > 30 min	56 (40.0)	230 (32.9)	1.6 (1.0–2.4)	1.1 (0.7–1.9) <sup>c</sup>
<b>Cost of reaching health centre, in dalasi</b>				
0–4	113 (80.7)	600 (85.7)	1.0	1.0
5–9	20 (14.3)	58 (8.3)	1.8 (1.1–3.2)	0.9 (0.3–3.2)
B 10	7 (5.0)	42 (6.0)	0.9 (0.4–2.1)	0.7 (0.2–2.4) <sup>d</sup>

FDSS, Farafenni demographic surveillance system; OR, odds ratio.

Factors included in multivariate analysis:

<sup>a</sup> Allocated health centre, distance to a health centre, readily available money, child vitamin A status, child vaccination status;

<sup>b</sup> Allocated health centre, travel time to a health centre, readily available money, child vitamin A status, child vaccination status;

<sup>c</sup> Rural residence;

<sup>d</sup> Travel time to a health centre, distance to a health centre, readily available money, child vitamin A status, vaccination status, rural residence.

Guinea<sup>12</sup> and India.<sup>19</sup> Social support is thought to facilitate health care access through increasing help with domestic tasks, peer encouragement and knowledge-sharing. In Ethiopia, a significant protective association between increased social capital (defined in terms of membership in community groups, evidence of leadership, ability to borrow money, trustworthiness and interpersonal indicators) and child death was identified.<sup>20</sup> Some caregivers are also socially excluded at health centres and treated in a discriminatory fashion.<sup>18</sup> Thus, impaired access affects even those who attend health facilities.

Financial autonomy is likely to increase the primary caregiver's ability to access health care and pay for it. Qualitative research in Ghana has drawn attention to the importance of female financial autonomy for household expenditure in terms of the ability to obtain health care,<sup>28</sup> while children of Tanzanian women who were the sole decision-makers regarding health care

were significantly less likely to die.<sup>29</sup> Our findings show that children of caregivers who did not have to do odd jobs to pay for health care or who were able to generate money for health care by cutting back on spending were less likely to die. In Viet Nam, poor people who had to borrow money delayed seeking treatment at health facilities.<sup>30</sup> Together, these findings indicate that lack of an available monetary source to cover health care costs delays health care seeking behaviour and increases the risk of death.

When investigating the caregiver's time availability, having to care for other children besides the one at risk of death showed a protective effect clearly not explained by high maternal parity or overcrowding. In contrast, Van den Broeck et al. showed that the risk of child death in the northern Democratic Republic of the Congo increased with a parity of five or more as a result of having limited time for child care.<sup>7</sup> It is possible that primary caregivers that

look after more children have greater experience with serious illness and seek help earlier. Previous research has shown that poor symptom recognition delays health care seeking and that caregiver knowledge about health protects against child death.<sup>28,31,32</sup>

A majority of deaths in this study were caused by infectious diseases. In over 80% of the cases the illness lasted less than 1 week, and over half the children died at home (53%). According to previous research using verbal autopsies in the Gambia<sup>33</sup> and Guinea-Bissau,<sup>34</sup> acute diarrhoea and fever are the leading causes of death in children under 5 years of age. Studies in the Gambia,<sup>33</sup> Guinea-Bissau<sup>34</sup> and the United Republic of Tanzania<sup>21</sup> have shown that children most commonly die at home. In this study the number of children who received modern health care (as opposed to traditional treatments) for their illness is consistent with the findings of recent studies in Guinea-Bissau<sup>34</sup> and the United Republic of Tanzania,<sup>21</sup> where 93% and 75% of children, respectively, sought modern health care.

### Study strengths and weaknesses

Selection from the community at large allowed inclusion of cases and controls who did not utilize health care services. We chose death as the outcome because it represents severe illness, it is clearly defined and measurable, and its risk factors in children under 5 years of age in developing countries are poorly known. Future studies might include other outcome variables. The use of FDSS data for selection ensured that cases and controls were from the same population and that the majority of cases were included, which minimized selection bias. We considered selecting controls who were ill, but frequent illness is extremely common, if not universal, among Gambian children, and both cause-specific and non-cause-specific definitions of illness are problematic. The FDSS population may not be fully representative, as individuals need to have resided in the area for 3 months before being registered, so recent migrants and the transient population may have been excluded. However, because these people are probably the most susceptible to social exclusion, including them would probably have strengthened our findings.

Table 3. Association between primary caregiver social support indicators and mortality in children under 5 years of age, FDSS, the Gambia

Variable name	Cases No. (%)	Controls No. (%)	Crude OR (95% CI)	Adjusted OR (95% CI)
<b>Had someone who understood your problems</b>				
Most or all of the time	97 (69.3)	490 (70.0)	1.0	1.0
Some of the time	35 (25.0)	166 (23.7)	1.1 (0.7–1.6)	1.1 (0.7–1.6)
A little or none of the time	8 (5.7)	44 (6.3)	0.9 (0.4–2.0)	0.9 (0.4–2.0)*
<b>Had someone who showed you kindness and caring (n = 699 due to missing data)</b>				
Most or all of the time	91 (65.0)	428 (61.2)	1.0	1.0
Some of the time	41 (29.3)	195 (27.9)	1.0 (0.7–1.5)	0.8 (0.5–1.3) <sup>a</sup>
A little or none of the time	8 (5.7)	76 (10.9)	0.5 (0.2–1.1)	0.4 (0.2–0.9) <sup>a</sup>
<b>Had someone to relax with</b>				
Most or all of the time	70 (50.0)	340 (48.6)	1.0	1.0
Some of the time	30 (21.4)	248 (35.4)	0.6 (0.4–0.9)	0.5 (0.3–0.9) <sup>b</sup>
A little or none of the time	40 (28.6)	112 (16.0)	1.7 (1.1–2.7)	1.8 (1.1–2.9) <sup>b</sup>
<b>Had someone to take you to a doctor (n = 699 due to missing data)</b>				
Most or all of the time	130 (92.9)	665 (95.1)	1.0	1.0
Some of the time	7 (5.0)	31 (4.4)	1.1 (0.5–2.6)	1.1 (0.5–2.7) <sup>c</sup>
A little or none of the time	3 (2.1)	3 (0.4)	5.0 (1.0–24.9)	4.5 (0.9–22.9) <sup>c</sup>
<b>Had someone to prepare meals if you were unable to</b>				
Most or all of the time	103 (73.6)	541 (77.3)	1.0	1.0
Some of the time	18 (12.9)	108 (15.4)	0.9 (0.5–1.5)	0.9 (0.5–1.6) <sup>d</sup>
A little or none of the time	19 (13.6)	51 (7.3)	2.0 (1.1–3.5)	2.3 (1.2–4.1) <sup>d</sup>
<b>Had someone to help with domestic duties</b>				
Most or all of the time	101 (72.1)	480 (68.6)	1.0	1.0
Some of the time	18 (12.9)	153 (21.9)	0.5 (0.3–0.9)	0.5 (0.3–0.9) <sup>e</sup>
A little or none of the time	21 (15.0)	67 (9.6)	1.5 (0.9–2.6)	1.8 (1.0–2.9) <sup>e</sup>
<b>Participation in social groups</b>				
Yes	119 (85.0)	639 (91.3)	1.0	1.0
No	21 (15.0)	61 (8.7)	1.8 (1.1–3.1)	3.6 (1.9–6.9) <sup>f</sup>
<b>Had someone to talk with</b>				
Most or all of the time	80 (57.1)	421 (60.1)	1.0	1.0
Some of the time	43 (30.7)	228 (32.6)	1.0 (0.7–1.5)	1.0 (0.7–1.5)
A little or none of the time	17 (12.1)	51 (7.3)	1.7 (1.0–3.2)	1.7 (1.0–3.2)*
<b>Had someone to give good advice in a crisis</b>				
Most or all of the time	119 (85.0)	586 (83.7)	1.0	1.0
Some of the time	15 (10.7)	111 (15.9)	0.6 (0.4–1.2)	0.8 (0.4–1.4) <sup>g</sup>
A little or none of the time	6 (4.3)	3 (0.4)	13.3 (2.7–66.5)	23.1 (4.3–123.4) <sup>g</sup>

FDSS, Farafenni demographic surveillance system; OR, odds ratio. \* Association not altered more than 10% following multivariate analysis.

Factors included in multivariate analysis:

<sup>a</sup> Primary caregiver ethnicity, allocated health centre, number of members in household;

<sup>b</sup> Primary caregiver ethnicity, allocated health centre, rural residence;

<sup>c</sup> Allocated health centre;

<sup>d</sup> Allocated health centre;

<sup>e</sup> Rural residence;

<sup>f</sup> Rural residence, primary caregiver ethnicity, allocated health centre, number of members in household;

<sup>g</sup> Primary caregiver ethnicity, primary caregiver household position, rural residence, allocated health centre.

Table 4. Association between primary caregiver financial indicators of access to health care and child death, FDSS, the Gambia

Variable	Cases No. (%)	Controls No. (%)	Crude OR (95% CI)	Adjusted OR (95% CI)
<b>Primary caregiver wealth</b>				
Amount of income generated by primary caregiver, in dalasi				
0	95 (67.9)	383 (54.7)	1.0	1.0
1–500	23 (16.4)	115 (16.4)	0.8 (0.5–1.3)	1.0 (0.5–2.0) <sup>a</sup>
> 500	22 (15.7)	202 (28.9)	0.4 (0.3–0.7)	0.6 (0.3–1.2) <sup>a</sup>
Received money from an outside source				
Yes	53 (37.9)	286 (40.9)	1.0	1.0
No	87 (62.1)	414 (59.1)	1.1 (0.8–1.6)	1.1 (0.8–1.6)*
<b>Financial autonomy (95 cases and 383 controls had no income)</b>				
Could decide how earned money was spent				
All	41 (91.1)	306 (96.5)	1.0	1.0
Some, a little, or none	4 (8.9)	11 (3.5)	9.7 (1.0–92.5)	12.7 <sup>b</sup> (1.3–127.6) <sup>b</sup>
Used own money to pay for health care				
Yes	12 (8.6)	36 (5.1)	1.0	1.0
No	128 (91.4)	664 (94.9)	0.6 (0.3–1.2)	0.5 (0.2–1.0) <sup>c</sup>
<b>Monetary sources used to cover health care costs (indicators of availability)</b>				
Savings				
Yes	72 (51.4)	393 (56.1)	1.0	1.0
No	68 (48.6)	307 (43.9)	1.2 (0.8–1.7)	1.2 (0.8–1.7)*
Cutting back on spending				
Yes	18 (12.9)	186 (26.6)	1.0	1.0
No	122 (87.1)	514 (73.4)	2.5 (1.5–4.2)	2.5 (1.5–4.2)*
Selling goods of livestock				
Yes	59 (42.1)	233 (33.3)	1.0	1.0
No	81 (57.9)	467 (66.7)	0.7 (0.5–1.0)	0.9 (0.6–1.3) <sup>d</sup>
<b>Monetary sources used to cover child death and health care costs (indicators of unavailability)</b>				
Doing odd jobs				
No	103 (73.6)	640 (91.4)	1.0	1.0
Yes	37 (26.4)	60 (8.6)	3.8 (2.4–6.2)	3.4 (2.1–5.5) <sup>e</sup>
Borrowing from friends				
No	133 (95.0)	664 (94.9)	1.0	1.0
Yes	7 (5.0)	36 (5.1)	1.0 (0.4–2.2)	0.7 (0.3–1.7) <sup>f</sup>
Borrowing from lenders				
No	137 (97.9)	682 (97.4)	1.0	1.0
Yes	3 (2.1)	18 (2.6)	0.8 (0.2–2.8)	0.6 (0.2–2.2) <sup>g</sup>
<b>Time availability</b>				
Average amount of time spent working at any occupation, in hours				
0–5	9 (6.4)	109 (15.6)	1.0	1.0
6–10	108 (77.1)	511 (73.0)	2.6 (1.3–5.3)	2.9 (0.8–10.2) <sup>h</sup>
11–15	23 (16.4)	80 (11.4)	3.6 (1.6–8.4)	2.5 (0.6–10.1) <sup>h</sup>
Number of other children cared for by primary caregiver				
0	14 (10.0)	28 (4.0)	1.0	1.0
1–3	90 (64.3)	462 (66.0)	0.4 (0.2–0.8)	0.2 (0.1–0.5) <sup>i</sup>
B 4	36 (25.7)	210 (30.0)	0.3 (0.2–0.7)	0.2 (0.1–0.4) <sup>i</sup>

FDSS, Farafenni demographic surveillance system; OR, odds ratio. \* Association not altered beyond 10% following multivariate analysis.

Factors controlled for in multivariate analysis:

<sup>a</sup> Allocated health centre, readily available money, vitamin A status, vaccination status, time spent working, rural residence;

<sup>b</sup> Primary caregiver educational level;

<sup>c</sup> Primary caregiver ethnicity, primary caregiver age, rural residence, time spent working, primary caregiver education level;

<sup>d</sup> Rural residence, allocated health centre;

<sup>e</sup> Rural residence;

<sup>f</sup> Rural residence, allocated health centre;

<sup>g</sup> Allocated health centre;

<sup>h</sup> Rural residence, allocated health centre, vaccination status, vitamin A status;

<sup>i</sup> Number of pregnancies of primary caregiver.

Recall bias was minimized by means of personal prompts, and responder bias was reduced by conducting interviews in private locations and not providing response options. Low refusal and drop-out rates made non-participation bias unlikely. We controlled for a wide range of confounding factors by means of multivariate analysis, although we could not assess birth weight.

## Conclusion

A simplistic approach to health care provision in countries such as the Gambia, based on distance and travel time to a health facility, may be inadequate.

In light of the priority to achieve the fourth Millennium Development Goal by 2015, reductions in child mortality through improved health care access will benefit from a focus on additional measures. The strengthening of social support networks for children's caregivers might be achieved through community group development and implementation of community systems that can provide them with the support they need when seeking health care.<sup>20</sup> It is important to also improve their access to financial resources through tools such as micro financing<sup>35</sup>. Further research in other settings is required to confirm these findings.

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## Résumé

### Accès aux soins de santé et mortalité des enfants de moins de 5 ans en Gambie : étude cas-témoins

**Objectif** Évaluer les éventuelles associations entre les mesures classiques de l'accès aux soins (distance et durée du trajet jusqu'à l'établissement) ou les mesures non conventionnelles (indicateurs de soutien social et financier) et la mortalité des enfants de moins de 5 ans en Gambie.

**Méthodes** Nous avons mené une étude cas-témoins dans une population sous surveillance démographique. Les cas ( $n = 140$ ) étaient des enfants de moins de 5 ans, décédés entre le 31 décembre 2003 et le 30 avril 2006. Chaque cas était apparié selon l'âge et le sexe à 5 témoins ( $n = 700$ ). Des informations ont été recueillies en interrogeant les aidants principaux. Les données ont été analysées par régression logistique classique.

**Résultats** Parmi les mesures classiques de l'accès aux soins, seule la distinction entre résidence en milieu rural et résidence en milieu urbain ou périurbain était importante : les enfants provenant de zones rurales avaient une plus grande probabilité de mourir (OR : 4,9 ; IC à 95 % 1,2-20,2). S'agissant des mesures non conventionnelles, la probabilité de décès des enfants était plus

forte si leur aidant principal manquait d'aide pour la préparation des repas (OR : 2,3 ; IC à 95 % : 1,2-4,1), n'avait personne avec qui se détendre (OR : 1,8 ; IC à 95 % : 1,1-2,9), n'avait personne pour lui prodiguer de bons conseils (OR : 23,1 ; IC à 95 % : 4,3-123,4), n'avait pas son mot à dire sur la façon dont l'argent gagné était dépensé (OR : 12,7 ; IC à 95 % : 1,3-127,6), était dans l'incapacité de réduire les dépenses de santé (OR : 2,5 ; IC à 95 % : 1,5-4,2) ou devait effectuer des « petits boulots » pour payer ces dépenses (OR : 3,4 ; IC à 95 % : 2,1-5,5). Un effet protecteur a été observé lorsque l'aidant principal devait également s'occuper d'autres enfants (OR : 0,2 ; IC à 95 % : 0,1-0,5).

**Conclusion** Améliorer l'accès aux soins des enfants en Gambie ou dans d'autres contextes similaires ne signifie pas seulement réduire le temps de trajet et la distance jusqu'à l'établissement de soins, mais suppose un renforcement des réseaux de soutien aux aidants et un meilleur accès pour eux aux ressources financières dont ils ont besoin.

## Resumen

### Acceso a atención de salud y mortalidad de menores de 5 años en Gambia: estudio de casos y controles

**Objetivo** Determinar si las medidas tradicionales (distancia y tiempo de viaje hasta un establecimiento) y no tradicionales (indicadores de apoyo social y financiero) de acceso a la atención de salud guardan relación con la mortalidad entre los menores de 5 años en Gambia.

**Métodos** Llevamos a cabo un estudio de casos y controles en una población sometida a vigilancia demográfica. Los casos ( $n = 140$ ) fueron niños menores de 5 años fallecidos entre el 31 de diciembre de 2003 y el 30 de abril de 2006. Cada caso se emparejó por edad y sexo con cinco controles ( $n = 700$ ). Se entrevistó a los cuidadores principales para reunir la información pertinente, analizándose luego los datos mediante regresión logística condicional.

**Resultados** De las medidas tradicionales de acceso, sólo la residencia rural frente a la urbana/periferia tenía un efecto importante: los niños de las zonas rurales tenían más probabilidades de morir (OR: 4,9; intervalo de confianza (IC) del 95%: 1,2-20,2). En cuanto a las medidas no tradicionales, los

niños tenían más probabilidades de morir cuando sus cuidadores principales carecían de ayuda para preparar las comidas (OR: 2,3; IC95%: 1,2-4,1), no disponían de nadie con quien distenderse (OR: 1,8; IC95%: 1,1-2,9), no tenían a nadie que pudiera ofrecerles buenos consejos (OR: 23,1; IC95%: 4,3-123,4), no podían influir apenas en las decisiones de gasto del dinero ganado (OR: 12,7; IC95%: 1,3-127,6), no podían reducir el gasto en atención de salud (OR: 2,5; IC95%: 1,5-4,2) o tenían que desempeñar trabajos poco corrientes para pagar la atención (OR: 3,4; IC95%: 2,1-5,5). Un efecto protector fue que el cuidador tuviera que ocuparse también de otros niños (OR: 0,2; IC95%: 0,1-0,5).

**Conclusión** La mejora del acceso a la atención sanitaria para los niños de Gambia y entornos similares no estriba simplemente en reducir el tiempo de viaje y la distancia a los centros de salud. Es preciso mejorar las redes de apoyo a los cuidadores y su acceso a los recursos financieros que necesitan.

	95% CI	OR	95% CI	OR	95% CI
1.8	(1.1, 2.9)	1.8	(1.1, 2.9)	1.8	(1.1, 2.9)
23.1	(123.4, 4.3)	23.1	(123.4, 4.3)	23.1	(123.4, 4.3)
12.7	(127.6, 1.3)	12.7	(127.6, 1.3)	12.7	(127.6, 1.3)
2.5	(4.2, 1.5)	2.5	(4.2, 1.5)	2.5	(4.2, 1.5)
3.4	(5.5, 2.1)	3.4	(5.5, 2.1)	3.4	(5.5, 2.1)
0.1	(0.5, 0.2)	0.1	(0.5, 0.2)	0.1	(0.5, 0.2)
4.9	(20.2 - 1.2)	4.9	(20.2 - 1.2)	4.9	(20.2 - 1.2)
2.3	(4.1, 1.2)	2.3	(4.1, 1.2)	2.3	(4.1, 1.2)

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