Gender, literacy, and survival among Ethiopian adults, 1987–96

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Objective To examine relationships between gender, literacy and survival among adults in Meskan and Mareko district, Ethiopia.
Methods On the basis of an established demographic surveillance system, an open-cohort analysis of 172 726 person-years covering the period January 1987 to December 1996 was conducted in 10 randomly selected local communities.
Findings The crude mortality rate was 11.2 per 1000 person-years among adults aged ⩾15 years; the values for males and females were 11.9 and 10 .6 per 1000 person-years, respectively. Kaplan–Meier estimates showed that literacy and being female were both favourable for survival throughout adulthood. Cox's regression models showed that age, gender, literacy and area (rural lowland, rural highland and urban) were significant factors in survival: younger, female, literate urban dwellers were the most favoured. Gender differences in mortality were small in the rural areas, possibly because of the harsh living conditions and the marginalization of women. Literacy was a more significant factor for survival in the rural areas, where mortality was highest, while gender was more important in the one urban area studied. The levels of literacy were lowest among rural females.
Conclusion Special attention should be given to raising literacy levels among rural women with a view to improving their survival.

Keywords Mortality; Survival; Educational status; Sex factors; Age factors; Socioeconomic factors; Rural population; Urban population; Men; Women; Adult; Cohort studies; Regression analysis; Ethiopia (*source: MeSH, NLM*).

Mots clés Mortalité; Survie; Niveau instruction; Facteur sexuel; Facteur âge; Facteur socio-économique; Population rurale; Population urbaine; Hommes; Femmes; Adulte; Etude cohorte; Analyse régression; Ethiopie (*source: MeSH, INSERM*).

Palabras clave Mortalidad; Supervivencia; Escolaridad; Factores sexuales; Factores de edad; Factores socioeconómicos; Población rural; Población urbana; Hombres; Mujeres; Adulto; Estudios de cohortes; Análisis de regresión; Etiopía (*fuente: DeCS, BIREME).*).

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Introduction

Many health indicators for adults exhibit considerable gender differences according to an individual's social position and role (*1*, *2*). Worldwide, male mortality rates exceed those of females at all ages, while females have a longer life expectancy than males (on average 68 years and 63 years, respectively) (*3*, *4*). Poverty tends to compromise this female survival advantage, suggesting that more detailed investigations of lifestyle and survival issues for men and women in poor communities are needed. Although the overall historical trend of excess female mortality may have been moderated (*5*), higher female mortality in the reproductive years is still reported from some nonindustrial countries (*6*, *7*). Improved gender equality and associated changes in the social, economic, and educational status of women seem to have favoured superior female survival and reduced earlier gender differences in industrialied which favoured males (*7–10*). Smoking, excessive drinking, and occupational hazards among males may contribute to the gender mortality gap that favours females in industrialized countries (*4*). Courtenay has discussed how cultural norms that are used to maintain men's social power and sense of masculinity undermine their efforts to adopt healthier habits and beliefs, thus putting them at a higher risk of poor health than women (*11*).

Gender inequality is an impediment to the elimination of differentials in health status. It can arise from the social, cultural, economic, legal, and political characteristics of a society. In developing countries, these norms usually favour males and deny women their basic rights (*12*); for example, literacy rates are generally lower among females than among males (*3*). Thus there is a need to address gender inequality in order to design and implement appropriate strategies for achieving an acceptable level of health for all citizens. In low-income countries, information relating to the nature and extent of inequalities is scarce (*13*).

Gender differences in survival are believed to be determined by a balance between biogenetic and environmental causes, including social, cultural, economic, and behavioural factors. On the one hand, females are biologically better protected from infectious diseases, which are still highly prevalent in developing countries. Studies in animals and humans have shown that greater vulnerability to infectious disease is related to X-linked genetic factors in males. In females, endogenous sex hormones reduce the risk of ischaemic heart disease (*6*, *13*). On the other hand, the

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subordination of women in patriarchal settings may undermine their biological advantages with regard to survival. They are frequently discriminated against when access to social resources, such as education and health services, is concerned (*14–16*). In the poorest circumstances, women are likely to be at excessive risk of mortality associated with pregnancy and childbirth as well as having low status in the household and in society at large (*7*, *9*, *10*, *13*). The risk of dying from pregnancy-related problems, for example, is estimated to be up to 200 times greater in the least developed countries than in the developed world (*17*, *18*).

In developing countries, community-based statistics are not widely available, and gender-disaggregated analyses to show differences in mortality are uncommon and possibly unrepresentative. Thus there is a need for public health analyses of local and regional data in order to illuminate the social inequalities in health between men and women (*19*).

The present paper explores mortality patterns in an adult Ethiopian population in order to identify gender differences. In particular, it attempts to illustrate gender inequalities in survival, accounting for individual literacy and differences between three socioeconomically defined geographical areas.

Methods

The study was conducted in Meskan and Mareko district in southern-central Ethiopia, 130 km south of Addis Ababa, and one of the most densely populated areas of the country. Approximately two-thirds of the population are Muslims and there is a substantial minority of orthodox Christians. The total population is estimated to be 230 000, of whom 87% live in rural areas (*20*).

The Ethiopian population is organized into small administrative units or *kebeles*, called peasants' associations in rural areas and urban dwellers' associations in urban areas. The present data concern 10 randomly sampled *kebeles* out of a total of 86 in the district (nine rural peasants' associations and one urban dwellers' association in Butajira town), which were selected to form the Butajira Rural Health Programme in 1986 (*21*). An initial census of the study areas was undertaken in April 1986 after all houses had been mapped and numbered. Basic demographic, social and housing conditions were recorded for each household on entry into the surveillance system and during a further census in 1995. The demographic surveillance system has been maintained continuously since January 1987. Initially, the surveillance covered 28 616 people, of whom 13 801 were males and 14 815 females; 48% were children aged <15 years and 3% were aged ⩾65 years. Data were obtained monthly by trained lay field workers, who were high-school graduates, on births, deaths and migration, by means of house-to-house visits and the use of a structured questionnaire. The quality of the data was maintained through regular supervision in the field by trained supervisors and researchers.

The population lives in urban, rural lowland, and rural highland areas, which were investigated separately. The rural lowland and highland areas were defined, respectively, as being <2000 m and ⩾2000 m above sea level. The urban *kebele*, in Butajira town, is at a similar altitude to the rural highland areas. The climate in the highland areas is relatively humid and cool and that in the lowlands relatively dry and hot. In the rural highlands the major staple food is false banana (*enset*), consisting largely of carbohydrate, while in the lowlands it comprises maize and sorghum. In the highlands the cash crop is *khat*, a stimulant, while in the lowlands the cash crop is pepper. Most of the dwellings in the rural areas are thatched round huts. The highland villages are nearer than the lowland ones to Butajira town. Rivers provide the source of water for most people in the highlands, whereas wells predominate in the lowlands. Only community health posts provide health care in the rural areas. There are no schools in the villages. Malaria is hypoendemic in the highlands, while in the rural lowlands it is endemic and occurs throughout the year, although mainly during and immediately after the rains of June to September. The annual population growth rates are 1.96% in the highlands and 2.85% in the lowlands. Illness during the two weeks preceding the interview was recalled by 8.5% and 28.9%, respectively, of survey respondents in the highlands and lowlands (*21–23*).

In the urban area of Butajira town the climate is humid and cool, the staple diet varies according to social class, malaria is not endemic, and most houses are rectangular with corrugated iron roofs. There are some drug stores and a health centre. Piped water is available to most people and electricity is supplied continuously from a hydroelectric plant. There are postal and telecommunications services and primary and secondary schools are established. The population growth rate is 4.46% per annum. Illness during the two weeks preceding the interview was recalled by 4.6% of respondents (*21–23*).

In the study area, communicable diseases accounted for over 60% of deaths. Acute febrile illness, mainly malaria, diarrhoeal disease and tuberculosis, were major causes of adult mortality. Liver conditions were the most prominent of the noncommunicable diseases causing mortality. Injuries accounted for fewer than 2% of deaths (*21–23*).

The adult population was stratified by age, i.e. reproductive age (15–44 years), middle age (45–64 years) and elderly (⩾65 years). Literacy was defined as the ability to read and write, regardless of the educational level attained, and was ascertained on entry to the study during the initial census or at any time later and during the 1995 census. Individuals reported as being literate at one or more points during the study were classified as literate for the purposes of analysis.

Data collected over 10 years (January 1987 to December 1996), including the census data for 1986 and 1995, were entered using dBase and analysed using Stata Statistical Software, release 7.0 (Stata Corporation, College Station, TX, USA). For the calculation of person-time, the starting points were the beginning of the study period, the date of birth or the date of in-migration, while the end-points were the date of death, the date of out-migration or the end of the study period, i.e. a dynamic open cohort. Crude and adjusted (Mantel–Haenszel) rate ratios and 95% confidence intervals (CI) were used to compare mortality rates by gender, area of residence, and literacy status. The data were modelled using Cox's proportional hazards regression of the factors involved in survival.

Results

During the study period, 172 726 person-years were generated from 34 842 adults aged ⩾15 years. There were 1938 deaths and the crude mortality rate was 11.2 per 1000 person-years, 11.9 for males and 10.6 for females. Table 1 shows these rates

Table 1. **Gender-specific mortality rates per 1000 person-years and life expectancies, by area of residence, for 172 726 person-years observed in adults aged ⩾15 years, Meskan and Mareko district, Ethiopia, 1987–96**

	Area of residence					
	Urban		Highland		Lowland	
	Female	Male	Female	Male	Female	Male
Overall crude mortality rate	6.3 (5.2–7.6)[a]	9.4 (7.9–11.2)	11.2 (10.2–12.2)	12.7 (11.6–13.8)	12.0 (10.9–13.3)	12.1 (10.9–13.4)
Mortality rate by age group (years)						
15–44	2.8 (2.0–3.9)	5.0 (3.8–6.5)	6.6 (5.8–7.5)	6.6 (5.7–7.6)	7.4 (6.4–8.5)	8.0 (6.9–9.3)
45–64	8.6 (5.7–12.9)	17.1 (12.3–23.7)	18.1 (15.3–21.3)	18.8 (16.0–22.1)	25.6 (21.3–30.7)	18.3 (15.1–22.1)
⩾65	30.3 (22.7–40.7)	43.9 (32.1–60.1)	59.0 (49.1–70.0)	63.2 (54.1–74.0)	59.8 (47.6–75.1)	54.2 (43.0–68.2)
Further life-years expected at						
15 years	59.8	51.8	48.7	48.6	45.9	47.3
45 years	33.7	28.2	26.2	26.1	23.7	26.3
65 years	18.2	15.8	13.7	13.7	13.8	13.8

[a] Figures in parentheses are 95% confidence intervals.

by age group and area, together with projected life expectancies. At 15 years of age, life expectancy in the different areas was highest (74.8 years) for urban women and lowest (60.9 years) for rural lowland women. Males showed a much smaller range of life expectancy by area (62.3–66.8 years).

The literacy status of the study population as recorded in 1987 and 1995 showed no major improvement, although a consistently higher proportion of females were illiterate across all areas and over time (Fig. 1). Table 2 shows gender-specific mortality rates for a range of background factors, together with the corresponding female:male ratios for these rates. The Mantel–Haenszel combined rate ratios for area, time period, individual literacy and literacy within the individual's household were all significantly lower than 1 as individual factors among females. The household literacy factor is intended to reflect the possible effects on an individual of residing in a household where the head and/or the head's spouse is literate. In Fig. 2 the Kaplan–Meier survival estimates by gender and literacy status show the adult lifetime survival advantages of being female and of being literate. This effect appears to be cumulative with age, although the smaller numbers of older literate people make comparisons of literacy among the elderly more difficult.

For Cox's proportional hazards regression modelling, a model was initially built that included the 9% of data for which literacy status was missing. A relatively high mortality was apparent (Table 2) but this was probably a methodological artefact, since one reason for missing the collection of data on literacy status could be the occurrence of death during the observation period. However, since the overall model did not change appreciably when the group of unknown literacy status was dropped, the models reported below exclude it and are thus based on a total of 160 336 person-years. The overall situation as reported in Table 3 reflects all the significant factors. Time period and household literacy were not significant in the multivariate model. With the exception of urban residence (female:male ratio of hazard ratios = 0.58), this model does not show major gender differences in survival with respect to the factors examined (age, area and literacy), although gender itself is a significant factor, reflecting higher female survival after allowing for age, area and literacy.

Further exploration of the above model shows a significant interaction between being female and urban residence, although literacy was unaffected; Table 4 shows the same Cox's proportional hazards model for each area. This reveals gender to be a more important factor for survival in the urban area, while literacy was more important in the rural area. Age had a more or less similar effect in all areas.

Discussion

The results show that mortality rates in general were higher in males than females and that they were higher in the rural than in the urban population. Gender differences were least pro-

Fig. 1. **Proportions of illiteracy, by gender and area, among 34 842 adults aged ⩾15 years, as recorded in household censuses in 1987 and 1995, Meskan and Mareko district, Ethiopia**

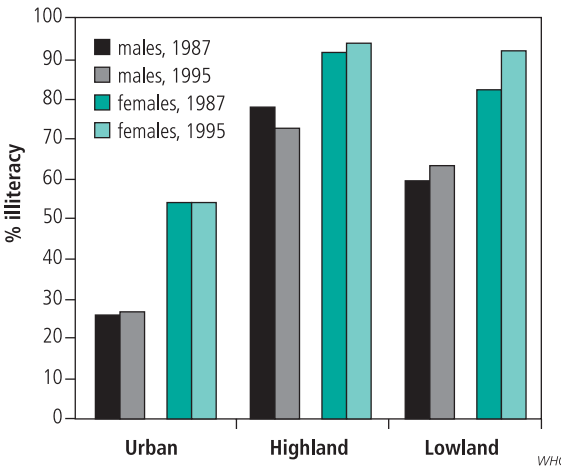

Table 2. **Gender-specific and relative mortality rates per 1000 person-years for 172 726 person-years observed for adults aged ⩾15 years, Meskan and Mareko district, Ethiopia, 1987–96**

	Females		Males		Female to male	
	Person-years	Mortality rate	Person-years	Mortality rate	Rate ratio	95% Confidence interval
Overall	90 596	10.6	82 130	11.9	0.89	0.81– 0.97
Age (years)						
15–44	70 983	6.2	61 759	6.8	0.91	0.79–1.84
45–64	14 814	18.6	15 671	18.4	1.01	0.86–1.20
⩾65	4 799	50.2	4 700	57.0	0.88	0.74–1.05
M-H combined[a]	–	–	–	–	0.93	0.85–1.02
Area						
Lowland	31 748	12.0	29 541	12.1	0.99	0.86–1.15
Highland	42 593	11.2	38 994	12.7	0.88	0.78–1.00
Urban	16 254	6.3	13 594	9.4	0.67	0.51– 0.87
M-H combined[a]	–	–	–	–	0.89	0.82–0.98
Period						
1987–91	41 476	10.7	37 092	12.3	0.87	0.76–1.00
1992–96	49 120	10.4	45 036	11.6	0.90	0.80–1.02
M-H combined[a]	–	–	–		0.89	0.81–0.97
Literacy						
Literate	15 446	4.1	34 149	6.2	0.66	0.49–0.88
Illiterate	68 208	10.1	42 533	14.6	0.69	0.62–0.77
Unknown	6 942	29.8	5 448	26.2	1.14	0.91– 1.42
M-H combined[a]	–	–	–	–	0.75	0.68–0.82
Household literacy						
Both literate	9 085	5.1	9 436	9.3	0.54	0.37–0.78
Only head literate	14 788	8.7	15 107	8.4	1.04	0.81–1.34
Only spouse literate	1 597	10.0	1 320	12.1	0.83	0.39–1.77
Neither literate	36 291	10.9	37 213	14.5	0.75	0.66–0.86
Unknown	28 833	12.9	19 050	10.9	1.18	0.99–1.40
M-H combined[a]	–	–	–	–	0.88	0.80–0.96

[a] Mantel–Haenszel combined rate ratios.

Fig. 2. **Kaplan–Meier survival estimates by age, gender, and literacy for 160 336 person-years for adults aged ⩾15 years, Meskan and Mareko district, Ethiopia, 1987–96**

nounced in the rural lowlands, where mortality was highest. Irrespective of gender, literacy was associated with lower mortality rates than illiteracy. Literacy generally had a greater effect than gender on survival, although gender emerged as a more important factor in the urban area. Although time period and literacy within a household, and hence literacy differentials in relation to a spouse, were significantly related to mortality on a bivariate basis, their lack of contribution to the multivariate model suggests that they were not important factors in themselves.

Effect of location

While it is tempting to look for explanations for the larger gender difference in survival among urban residents, in view of the globally superior survival rates of females, it is perhaps more important to question the small gender differences in survival among the rural populations, after allowing for literacy status. The suggestion that female survival advantage may be reduced by poverty is consistent with this approach. The relatively harsh and demanding nature of rural life around Butajira for both men and women may contribute to the suppression of any inherent biological advantage for females. Rural life is generally based on plough cultivation, which involves heavy labour by males and the use of draft animals. Women's status tends to be subordinated in such agricultural settings, with little control by women over the products of their labour (*7*, *9*). These cultural norms could explain the similarities of results reported from rural Ethiopia and rural Somalia.

The diminished mortality differentials between women and men in rural areas could also be an indication of socioeconomic decline and the marginalization of the poorest people, mostly affecting the lowest status group, i.e. women

Table 3. **Results of multivariate Cox's proportional hazards regression models, by gender, for 160 336 person-years[a] observed in adults aged ⩾15 years from 1987 to 1996, Meskan and Mareko district, Ethiopia**

	Hazard ratio		
	Females	**Males**	**Overall**
Age (years)			
15–44	1	1	1
45–64	3.01 (2.55–3.57)[b]	2.76 (2.34–3.25)	2.86 (2.52–3.22)
⩾65	8.19 (6.80–9.86)	8.14 (6.84–9.71)	8.11 (7.15–9.21)
Area			
Lowland	1	1	1
Highland	0.83 (0.71–0.96)	0.92 (0.80–1.07)	0.91 (0.79–0.98)
Urban	0.47 (0.37–0.60)	0.81 (0.65–1.02)	0.55 (0.55–0.73)
Literacy			
Literate	1	1	1
Illiterate	1.55 (1.19–2.02)	1.49 (1.26–1.77)	0.83 (0.75–0.92)
Sex			
Male	–	–	1
Female			0.83 (0.75–0.92)

[a] Excluding observations for 12 390 person-years of unknown literacy status.
[b] Figures in parentheses are 95% confidence intervals.

Table 4. **Multivariate Cox proportional hazards regression models, by area, for 160 336 person-years observed[a] in adults aged ⩾15 years from 1987 to 1996, Meskan and Mareko district, Ethiopia**

	Hazard ratio		
	Rural lowlands	**Rural highlands**	**Urban**
Age (years)			
15–44	1	1	1
45–64	2.79 (2.31–3.37)[b]	2.91 (2.47–3.44)	3.17 (2.15–4.68)
⩾65	6.83 (5.47–8.54)	9.04 (7.60–10.75)	9.33 86.34–13.74)
Gender			
Male	1	1	1
Female	0.93 (0.79–1.10)	0.83 (0.72–0.96)	0.56 (0.41–0.76)
Literacy			
Literate	1	1	1
Illiterate	1.44 (1.17–1.77)	1.74 (1.37–2.22)	1.27 (0.89–1.81)

[a] Excluding observations for 12 390 person-years of unknown literacy status.
[b] Figures in parentheses are 95% confidence intervals.

(*24*). The major reported causes of adult death in the study area were malaria, tuberculosis, diarrhoeal disease, meningitis and pneumonia, all of which are related to poor socio-economic status. As the increasing involvement of men in the market economy takes them away from subsistence farming and leads to urban in-migration, women are left behind to cope with difficult situations in rural areas. Economic constraints, such as decreasing crop yields resulting from the degradation of agricultural land, erratic meteorological events, and declining farm size exacerbated by overpopulation, all adversely influence the health status of persons remaining in the villages, the worst affected groups being children and women (*8*, *25*, *26*). Further research into detailed patterns of life and activity among men and women in both rural and urban settings may be needed in order to further elucidate this matter.

Effect of literacy level

Literacy was an important factor for survival, both among men and women, particularly in the rural areas. Women's education is considered to be one of the strongest determinants of health, since educated women are more likely to break cultural norms and taboos that are detrimental to their health (*9*, *10*). Given the significantly higher hazard ratio for survival among the literate population, together with the relatively smaller proportion of females who were literate, it is arguable that more female education, particularly in rural settings, could prevent a large number of premature female deaths. While population-based measures against inherent risk factors such as gender are not possible, effective interventions can be mounted against adult illiteracy, not least by the improved education of future generations of adults. If literacy is an important factor for individual survival, the generally lower

literacy rate of women compared with men in poor societies may contribute directly to the apparently reduced female survival advantage in such settings.

Conclusion

This study demonstrated patterns of gender and literacy differentials in adult mortality in rural Ethiopia. Health and development planners should tackle such relatively small-scale differentials by designing appropriate interventions, with particular emphasis on disadvantaged rural women. Special attention should be given to improving literacy levels, particularly among women. Significant inequalities were demonstrated even in small geographical areas. The study indicated a need for a strong planning capability and a commitment at the district level to the implementation of effective interventions in decentralized local health departments. It also indicated a requirement for more detailed studies aimed at identifying socioeconomic and behavioural factors that contribute to the observed inequalities. ■

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Conflicts of interest: none declared.

Résumé

Relations entre sexe, niveau d'éducation et survie chez des éthiopiens adultes, 1987-1996

Objectif Examiner les relations entre le sexe, le degré d'éducation et la survie chez des adultes habitant le district de Meskan et Mareko (Ethiopie).

Méthodes En s'appuyant sur le système de surveillance démographique existant, une étude de cohorte ouverte a été réalisée de janvier 1987 à décembre 1996 sur 172 726 personnes-année dans 10 communautés locales sélectionnées aléatoirement.

Résultats Le taux brut de mortalité était de 11,2 pour 1000 personnes-année chez les adultes ⩾15 ans ; en fonction du sexe, ces chiffres étaient de 11,9 chez les hommes et 10,6 chez les femmes pour 1000 personnes-année. Les estimations par la méthode de Kaplan-Meier montrent que le degré d'éducation et le fait d'être une femme sont deux facteurs favorables à la survie dans la période adulte. Le modèle de Cox montre que l'âge, le sexe, le niveau d'éducation et le secteur d'habitation (basses terres rurales, hautes terres rurales et zones urbaines) sont des facteurs importants de survie : les habitants des zones urbaines jeunes, de sexe féminin, ayant un certain degré d'éducation sont les plus favorisés. Les écarts de mortalité en fonction du sexe sont faibles en milieu rural, en raison peut-être des conditions de vie difficiles et de la marginalisation des femmes. Le facteur de survie le plus important dans les zones rurales, où la mortalité est maximale, est le degré d'éducation; il est remplacé par le sexe dans une des zones urbaines étudiées. Le plus faible degré d'éducation s'observe chez les femmes des zones rurales.

Conclusion Il est souhaitable d'accorder une attention particulière au développement de l'éducation des femmes en milieu rural afin d'améliorer leur survie.

Resumen

Género, alfabetización y supervivencia entre los etíopes adultos, 1987–1996

Objetivo Examinar la relación entre el género, la alfabetización y la supervivencia entre los adultos del distrito de Meskan y Mareko, Etiopía.

Métodos Sobre la base de un sistema de vigilancia demográfica ya establecido, se realizó un análisis de cohortes abierto con 172 726 personas-año, que abarcó el periodo de enero de 1987 a diciembre de 1996, en 10 comunidades locales seleccionadas al azar.

Resultados La tasa bruta de mortalidad fue de 11,2 por 1000 personas-año entre los adultos ⩾ 15 años; las cifras para hombres y mujeres fueron de 11,9 y 10,6 por 1000 personas-año, respectivamente. Las estimaciones de Kaplan–Meier revelaron que la alfabetización y la condición de mujer eran ambos factores favorables para la supervivencia durante la vida adulta. Los modelos de regresión de Cox mostraron que la edad, el sexo, la alfabetización y la zona (tierras bajas rurales, altiplano rural y medio urbano) influían de manera importante en la supervivencia: las mujeres jóvenes y alfabetizadas que residían en ciudades eran las personas más favorecidas. Las diferencias de mortalidad por sexos fueron pequeñas en las zonas rurales, posiblemente debido a las duras condiciones de vida y la marginación de las mujeres. La alfabetización fue un factor más importante para la supervivencia en las zonas rurales, donde más alta era la mortalidad, mientras que el sexo fue más importante en la zona urbana estudiada. Los niveles de alfabetización más bajos fueron los hallados entre las mujeres rurales.

Conclusión Hay que poner especial interés en aumentar el nivel de alfabetización entre las mujeres de las zonas rurales a fin de mejorar su supervivencia.

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