Mortality among married older adults in the suburbs of Beirut: estimates from offspring data

AM Sibai, MN Kanaan, M Chaaya & OMR Campbell

Objective Countries in transition are characterized generally by poor statistical infrastructures and a dearth of vital information. In this study we use offspring data to examine mortality trends in married older men and women through a multipurpose household survey conducted in 2002 in the suburbs of Beirut, Lebanon. The country had been ravaged by war for almost 16 years.

Methods A random sample of 1520 respondents, with either or both parents surviving their 65th birthday, provided information on 1172 fathers and 1108 mothers. Age- and sex-specific mortality rates per 1000 person-years were estimated. Using log-linear Poisson regression, mortality risk was examined for three birth cohorts: those reaching age 65 before (pre-1975), during (1975–1990) and after (post-1990) hostilities in the country.

Findings A total of 1037 parental deaths were reported, yielding an overall mortality rate of 48.7 per 1000 person-years (51.4 among males and 45.3 among females). Compared to the pre-1975 cohort, older adults reaching age 65 during the war years, 1975–1990, had the highest mortality risk for both males (rate ratio, RR = 1.48, 95% confidence intervals, CI = 1.07–2.04) and females (RR = 1.22, 95% CI = 0.95–1.58). Mortality risk was significantly higher in males than females, a gender differential notably largest in the 1975–1990 cohort.

Conclusion This is the first population-based study in Lebanon to quantify patterns of mortality in cohorts of married older adults. The results suggest that the hostilities may have contributed to decreased survival, particularly among males. The approach used in the study presents a viable option for testing in larger surveys and population censuses in countries that lack reliable statistical infrastructures.


Introduction

In recent decades, older individuals have been the fastest-growing population segment worldwide. Compared to the industrialized world, the increase in the number and proportion of older adults in several developing countries is taking place at an accelerated pace that outstrips traditional welfare-support mechanisms. Unfortunately, these issues remain largely unrecognized by policy-makers and generally are under-researched in poorer settings.\(^1,2\) This is exacerbated by a lack of reliable data sources resulting in a dearth of information.

Lebanon, a small middle-income country (total population around 3.6 million) on the eastern Mediterranean coast, is such a case. It lacks national data on mortality in its older population. The health system in the country is characterized by a poor statistical infrastructure,\(^3\) attributable in part to a lack of financial and technical resources caused by the war that ravaged the country from 1975 until 1990.

When conventional data sources are unavailable or inadequate and resources are limited, several alternative approaches have been developed to derive estimates of mortality based on information about the survival of the respondents’ close kin.\(^4,5\) Recently, a modified but comparable technique using sibling\(^6\) and widowhood data\(^7\) has been used to estimate adult mortality in the Russian Federation. Using offspring data from a multipurpose household survey, we examined patterns of mortality in periods before, during (1975–1990) and after the war in several birth cohorts of older married men and women in Beirut.

Methods

Subjects and measurements

A cross-sectional multidimensional survey of three communities in the suburbs of Beirut was conducted in the spring of 2002 by the Center for Research on Population and Health of the American University of Beirut. The three communities (Hay el-Sellom, Naba’a and Bourj el-Barajneh) together have an estimated 150 000 inhabitants and are characterized overall by poor housing conditions. More than 50% of respondents to the survey in each community perceived themselves to be poor, and a large proportion of the study population was displaced as a result of the 16 years of civil war and regional conflicts. The three communities differed in their ethnic backgrounds. Residents of Hay el-Sellom and Naba’a were mostly Lebanese (over 92%); most of those in Bourj el-Barajneh were Palestinian refugees who were forced to leave their towns and villages as a result of the 1948 Arab–Israeli war.

The details of the design and conduct of the survey are presented elsewhere.\(^8\) Briefly, a random sample of

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\(^{1}\) Epidemiology and Population Health Department, Faculty of Health Sciences, American University of Beirut, Lebanon. Correspondence to AM Sibai (e-mail: ansibai@aub.edu.lb).

\(^{2}\) London School of Hygiene and Tropical Medicine, London, England.

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households was selected from randomly drawn primary sampling units proportional to population size. From a total of around 3470 households selected, 120 refused to be interviewed and 276 could not be contacted. This yielded an overall response proportion of 88.6%. Face-to-face interviews were conducted with an adult member of each household who was asked to report any parent who had survived beyond 65 years of age. Those who did so were asked when their parents were born, whether any were still alive at the time of the interview and, if not, to give their ages and years of death. The study protocol was approved by the Institutional Review Board (IRB) of the American University of Beirut.

Statistical methods
Only parents who survived their 65th birthdays were included in this analysis. Age was considered in seven five-year groupings and was treated as a time-dependent variable with subjects contributing person-years to multiple age groups. Age- and sex-specific mortality rates per 1000 person-years were estimated by dividing the number of death events over total observation time for each subject, the latter calculated from age 65 until censoring. Censoring was defined as either a change in the age stratum or the end of the study period, whichever came first. A total of 12 records with incomplete data on vital status or age were excluded from the analysis. Using log-linear Poisson regression, mortality risk was examined for three broad categories of cohorts corresponding to those reaching age 65 in the years prior to (pre-1975), during (1975–1990) and after (post-1990) the eruption of armed conflict in the country, while controlling for age. Rate ratios (RR) and their 95% confidence intervals (CI) were calculated by comparing risks of mortality in the latter two cohorts using the pre-1975 cohort as baseline. Using weighted data, analysis was stratified by gender. The S-PLUS statistical package (2000) was used for all analyses.

Results
A total of 1520 respondents, with a mean age of 47 years and predominantly female (77%), gave information on either (403 fathers, 339 mothers) or both of their parents (769 fathers, 769 mothers). The majority of respondents (58%) had attained only elementary level education – equivalent to nine years of schooling. There was no association between the respondents’ gender or education and whether both or either parent had reached their 65th birthday. However, respondents’ ages were significantly higher when both parents had lived beyond 65 years than when either parent was younger at the time of the survey (50 years versus 45 years, P-value < 0.05).

Information from the respondents contributed to the final analysis of mortality for 1172 fathers and 1108 mothers. A total of 1037 parental deaths were reported (613 fathers, 424 mothers). Their mean age at death was 77 (standard deviation, SD = 9.5 years) and 76 years (SD = 8.3 years), respectively.

Table 1 presents the percentage of deaths and mean age at death within each cohort stratified by community and gender. By the time of the data collection in 2002, almost all of the pre-1975 cohort members had died. Consequently, age at death was highest in this cohort – approaching 82 among both men and women. The larger the proportion of deaths, whether across cohorts or between genders, the higher the mean age at death. There was no significant difference in either the mortality risk or mean age at death across the three communities.

Males had significantly higher mortality than females (51.4 and 45.3 per 1000 person-years, respectively) with a rate ratio of 1.14 and 95% CI of 1.01 to 1.28. Survival decreased consistently with age and was lower for men than women in the younger age groups. Results of the Poisson regression in males showed that those who reached age 65 between 1975 and 1990 had a significantly higher mortality risk compared to the baseline (pre-1975) (RR = 1.48, 95% CI = 1.07–2.04); the post-1990 cohort exhibited a similar risk (RR = 1.16, 95% CI = 0.72–1.86). A similar trend was observed among females, albeit the results did not reach statistical significance (RR = 1.22, 95% CI = 0.95–1.58 and RR = 1.01, 95% CI = 0.56–1.82, respectively). Differentials in mortality by gender were notably higher for the 1975–1990 cohort (Fig. 1).

Discussion
Borrowing from demographers’ techniques, the application of the indirect approach presented an opportunity to estimate mortality risk among older adults. Such techniques are used widely to estimate child mortality and, more recently, adult mortality but we are unaware of any investigations of older adult mortality. Based on the reporting of 1520 adults in the suburbs of Beirut, the overall mortality of their parents who had reached the age of 65 was 51.4 per 1000 person-years for males and 45.3 per 1000 person-years for females. These yielded overall mortality of 48.7 per 1000 person-years. Owing to the limitations of the country’s vital registration system, it is difficult to compare our findings with those obtained from more traditional sources of mortality data, such as death certification. Nevertheless, the study methodology provided reasonable estimates when compared with mortality estimated from an earlier population-based cohort study conducted in Beirut between 1984 and 1994 among older men (44.7 per 1000 person-years) and women (36.0 per 1000 person-years) aged 60 years and over. Similarly, the mean ages at death attained in our study for subjects who had completed their life cycles (the pre-1975 cohort) (82.4 years for men and 81.7 years for women, Table 1) are comparable with those based on life expectancy calculations using current life-table techniques (80.9 years and 81.8 years, respectively). Both comparisons suggest that our study methodology and findings provide reasonable estimates of mortality statistics among older adults in Lebanon.

Mortality was highest in the birth cohorts reaching age 65 between 1975 and 1990, the period of war in Lebanon. It is difficult to establish whether this is attributable to the prevalent hostilities. Nevertheless, the traumatic events of the civil war affected the majority of the population by altering and changing the timing of normal life-course trajectories, such as health decline and retirement. The experience of war can be especially disruptive to an older adult, particularly while attempting to accommodate normative but significant life-course transitions. Hence in our study, those approaching old age during the Lebanese wars may have faced untimely life transitions, such as early widowhood, forced retirement, displacement and enduring financial problems that weakened their coping capacities and predisposed them to higher mortality risk. Earlier research work conducted in Beirut during wartime indicated that war stressors have a
disproportionately larger adverse effect on those with lower socioeconomic status and, consistent with our findings, the relationship is stronger in men than women.\textsuperscript{15} Furthermore, and because of the age-selection criteria imposed on the subjects included in the analysis (over 65 years), our findings are more likely to reflect an examination of period effect concurring with the war atrocities than a cohort effect of early environmental exposures. At the time this report was completed (July 2006) the country was ravaged by another war, resulting in over 1180 deaths and around 4500 wounded, nearly all civilians. With an overall economic loss of at least US$ 15 billion, this was one of the most devastating wars in Lebanon’s recent history; the toll on civilian life in terms of unemployment, displacement, poverty and psychosocial consequences has yet to surface.

Similar to other indirect techniques, the offspring method yields retrospective estimates with the reference point in time dependent on the respondent’s age group, the most recent being derived from the youngest.\textsuperscript{5} It is possible that those providing data on a year of death that occurred early in the study period have poorer recall. Furthermore, the method relied on a sample of offspring reporting on parents, a selection bias that limited the study sample because it excluded those older adults who had never had children. Nevertheless, the effect of this selection bias may not be so marked in this context: national data indicate that less than 5% of all elderly Lebanese people have never married.\textsuperscript{16} Earlier work consistently has shown that mortality differs by the social status of study subjects and that those with lower socioeconomic status are disadvantaged.\textsuperscript{7,17} While this is a worthy research question, the advantage gained by eliciting information on the socioeconomic status of the parents may be offset by the likelihood of recall bias from proxy respondents, the offspring in this case.

Consistent with many developing countries, Lebanon has a notable lack of reliable national estimates of mortality

<table>
<thead>
<tr>
<th>Community</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% deaths</td>
<td>Mean age at death ± SD</td>
</tr>
<tr>
<td><strong>Before hostilities (pre-1975) cohort</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hay el-Sellom</td>
<td>98</td>
<td>83.2 ± 10.6</td>
</tr>
<tr>
<td>Naba’a</td>
<td>97</td>
<td>82.3 ± 10.2</td>
</tr>
<tr>
<td>Bourj el-Barajneh</td>
<td>96</td>
<td>82.3 ± 10.0</td>
</tr>
<tr>
<td>Subtotal</td>
<td>97</td>
<td>82.4 ± 10.2</td>
</tr>
<tr>
<td><strong>During hostilities (1975–1990) cohort</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hay el-Sellom</td>
<td>68</td>
<td>75.6 ± 6.5</td>
</tr>
<tr>
<td>Naba’a</td>
<td>65</td>
<td>74.6 ± 6.5</td>
</tr>
<tr>
<td>Bourj el-Barajneh</td>
<td>73</td>
<td>73.5 ± 6.1</td>
</tr>
<tr>
<td>Subtotal</td>
<td>68</td>
<td>74.4 ± 6.4</td>
</tr>
<tr>
<td><strong>After hostilities (1990–2003) cohort</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hay el-Sellom</td>
<td>9</td>
<td>68.9 ± 2.0</td>
</tr>
<tr>
<td>Naba’a</td>
<td>17</td>
<td>67.8 ± 2.5</td>
</tr>
<tr>
<td>Bourj el-Barajneh</td>
<td>16</td>
<td>68.0 ± 2.8</td>
</tr>
<tr>
<td>Subtotal</td>
<td>14</td>
<td>68.1 ± 2.5</td>
</tr>
</tbody>
</table>

| All cohorts       | | | | | |
| Hay el-Sellom     | 39       | 78.1 ± 9.6 | 0.476 | 31 | 76.0 ± 9.2 | 0.110 |
| Naba’a            | 51       | 76.9 ± 9.5 | –   | 34 | 76.8 ± 8.4 | –   |
| Bourj el-Barajneh | 55       | 76.8 ± 9.4 | –   | 41 | 75.0 ± 7.6 | –   |
| Total             | 52       | 77.1 ± 9.5 | –   | 38 | 76.0 ± 8.3 | –   |

SD, standard deviation.
Mortalidad de personas de edad casadas en las afueras de Beirut: estimaciones basadas en datos de descendencia

Objetivo Los países en transición adolecen en general de unos servicios de estadística deficientes y de unos sistemas de registro civil poco informativos. En este estudio utilizamos datos aportados por la descendencia para analizar la evolución de la mortalidad entre la población de hombres y mujeres de edad casados mediante una encuesta de hogares polivalente realizada en 2002 en las afueras de Beirut, Líbano. Este país sufrió una guerra que duró casi 16 años.

Métodos Una muestra aleatoria de 1520 entrevistados, de los que al menos uno de los progenitores había llegado a cumplir 65 años, proporcionaron información sobre 1172 padres y 1108 madres. Se estimaron las tasas de mortalidad por edad y sexo por 1000 personas-ans. Puis on a analysé le risque de mortalité par régression (log-linéaire) de Poisson pour analyser le risque de mortalité pour trois cohortes d’adultes âgés et mariés, que les hostilités ont contribué à réduire le taux de survie, en particulier chez les hommes. La démarche utilisée représente une solution viable à tester dans des enquêtes de plus grande envergure ou dans des recensements de population ayant pour cadre des pays manquant d’infrastructures statistiques fiables.

Conclusions Other research has established that countries in transition are characterized generally by poor statistical infrastructures and a dearth of vital statistical information. Often mortality statistics are extrapolated from other settings, thus failing to recognize particularities within countries and yielding highly uncertain results. This research adds to this body of knowledge by using offspring data. The results from this population-based study in Lebanon quantify patterns of mortality in several cohorts of married older adults, and suggest the arms conflict in the country from 1975 to 1990 may have contributed to higher mortality.
ممكن التطبيق لدراسة المسوحات الكبيرة وتعداد السكان في بلدان تفتقد بنى الحياة، ولاسيما لدى الآباء. ويمثل الأسلوب الذي اتُّبع في الدراسة اختيارًا وتشير الموجودات والنتائج إلى أن أعمال العنف قد ساهمت في إنقاص فترة البقاء للفتـرة التعرُّف على كمية أنماط الوفيات لدى مجموعات الأتـراب المسنين المتزوجين.


**المصادر:** 10371-4176. ما جعل معدلات مشاركة الصور في directionalities of mortality amid middle-aged and older populations in Beirut, London: London School of Hygiene and Tropical Medicine, Department of Epidemiology and Population Sciences; 1997.

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