Mortality Differentials Among Israeli Men

ABSTRACT

Objectives. This study examined differentials in mortality among adult Israeli men with respect to ethnic origin, marital status, and several measures of social status.

Methods. Data were based on a linkage of records from a 20% sample of the 1983 census to records of deaths occurring before the end of 1992. The study population included 72 527 men, and the number of deaths was 17 378.

Results. Differentials in mortality by origin show that mortality was higher among individuals of North African origin than among those of Asian and European origin. After allowance for several socioeconomic indicators, the excess mortality among North African Jews was eliminated. Substantial and consistent differences in mortality were found according to education, occupation, income, possession of a car, housing, and household amenities. Differentials among the elderly were markedly narrower than those among men younger than 70 years.

Conclusions. Some sectors of Israeli society have higher risks of death than others, including, among the male population, these who are poor, less educated, unmarried, unskilled, out of the labor force, and of North African origin. (*Am J Public Health.* 1999;89: 1807–1813)

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Differentials in mortality and morbidity have been studied extensively in many countries, particularly the United Kingdom.[1] The debate in the United Kingdom[2–4] proliferated with the publication of the Black Report.[5] Interest in the topic has not been restricted to Britain, however, and during the last 30 years national studies of differences in mortality among socioeconomic groups have been undertaken in the Nordic countries,[6] central and southern European countries,[7,8] North America,[9,10] Japan,[11] and New Zealand.[12] In each country, the least advantaged sectors of society have been shown to suffer the highest mortality. The importance of this topic has been emphasized in the World Health Organization initiative Health for All by the Year 2000,[13] which targets reductions in health differences within and between countries.

Traditionally, the main indicator of social position used for investigating mortality differentials in Europe has been occupation. However, there are well-known problems involved with occupational categorizations,[14–17] such as classification of unemployed individuals. Thus, several alternative indicators have been related to mortality and morbidity, including educational attainment,[9,18,19] income,[17] home ownership,[20] possession of a car,[19] and unemployment.[21] These indicators represent various dimensions of socioeconomic status relating to past circumstances and behavior, and they influence future circumstances and behavior while being associated with health through complex mechanisms.[22] Such mechanisms include material deprivation, health-related behavior, and access to and use of health care.[23,24]

In Israel, studies of differential mortality have focused on country of origin.[25–27] Several cross-sectional studies have noted the excess mortality associated with North African origin, and explanations offered for the observed differences have included socioeconomic and genetic factors. However, a comprehensive assessment of mortality differentials associated with country of origin, adjusted for socioeconomic position, has not been reported previously.

This study investigated differentials in mortality among adult Israeli men with respect to sociodemographic characteristics. Our objectives were 2-fold. First, we sought to estimate differences in total mortality according to ethnic origin and marital status and to assess the role of intervening socioeconomic factors in relation to these mortality differences. Second, we attempted to estimate mortality differentials according to measures of social status and to enhance the interpretation of socioeconomic mortality differences by evaluating simultaneously the effects of several dimensions of socioeconomic position.

Methods

Data were derived from the Israel Longitudinal Mortality Study,[28] which links census records from a systematic 20% sample of households in the 1983 census to deaths occurring in the subsequent 9.5 years (i.e., until the end of 1992). Israel has a population register in which a unique number identifies every resident, newborn, or immigrant. Records were linked via identification numbers from the census and death notifications

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by the Israel Central Bureau of Statistics. Identification numbers were omitted from the data set. Methodologic details, including coverage and emigration, have been described elsewhere.[28]

We present analyses for Jewish men aged 45 to 89 years, excluding persons living in kibbutzim or institutions and those for whom ethnic origin could not be defined (as described subsequently). The study sample comprised 72 527 men, and the number of deaths in this sample was 17 378. Data included demographic and socioeconomic variables derived from the census and the date of death for people who died during the follow-up period.

Variables

The dependent variable was dichotomous (death during the study period was coded as 1, and a code of 0 was assigned otherwise). The independent variables were age at census (subdivided into 5-year groups), marital status at census, ethnic origin, level of education (0–8 years, 9–12 years, or 13 or more years), employment status (during the year preceding the census), occupation, monthly income, number of rooms in home (less than 3, 3, or more than 3), possession of car (yes or no), and household amenities.

Ethnic origin was classified according to country of birth. Father's country of birth was used for individuals born in Israel. Ethnic origin was categorized as follows: North Africa, Asia, and Europe. The last category included a small proportion (2.7%) of men from North and South America and Australia.

Occupation was defined for men aged 45 to 69 years in 1983 who were employed at that time or who had been employed 5 years before the census. Israel Central Bureau of Statistics[29] occupational categories were collapsed as follows: (1) high (professional, managerial, and technical), (2) middle (clerical, sales, and service workers), and (3) low (agricultural workers, skilled and unskilled workers).

Monthly income was based on reported wages in the 3 months preceding the census. Because of the high inflation rate in Israel at that time and extensive cases of unstated and misstated incomes, data were grouped in quartiles.

Household amenities, a derived variable, was based on possession of a food processor, electric oven, telephone, color television, vacuum cleaner, and bathtub (rather than only a shower). This variable was based on the first factor produced by a factor analysis model, and scores derived from an additive scale composed of items with high loadings on the first factor.

Statistical Analysis

Logistic regression models were used to assess differences in mortality according to sociodemographic variables. The effect of each variable was assessed both separately and in a multivariate analysis. All analyses controlled for age as a linear variable (a quadratic term for age was found to be nonsignificant). The multivariate analyses were carried out in stages, incorporating the temporal order of events. In the first stage (model 1), only ethnic origin and age were examined. Model 2 included education, usually acquired in early adulthood. The third model incorporated marital status, employment status, number of rooms in home, and possession of a car, all related to the time of the census. An additional index of socioeconomic status, household amenities, was included in model 4.

The fit of the sequential models was assessed via log-likelihood. The significant effect of each independent variable was assessed by a Wald-type χ^2 test (results not shown) as well as by tests for each category (relative to a reference category) of every variable. The latter tests should be interpreted cautiously, because they involve multiple comparisons.

Analyses were carried out for all men together as well as separately for the 45- to 69-year and 70- to 89-year age groups. Analyses including occupation were restricted to individuals aged 45 to 69 years who were employed at the time of the census or 5 years earlier. A limited number of interaction terms were tested (each in a separate model). No significant interactions were found; thus, results are based on models that included main effects.

To further validate our results, we repeated analyses using Cox's proportional hazards model. The 2 models (i.e., logistic regression and proportional hazards) have been shown to give similar results for rare events and for relatively short follow-up periods.[30] Results of Cox's proportional hazards analysis supported the findings of the logistic regression analysis. A potential problem in the models used was collinearity arising from correlation between the independent variables. The estimated correlation coefficients for these variables were moderate, with a correlation of 0.41 between income and education. Nevertheless, we used an adaptation of the standard inflation factors method for logistic regression to assess the magnitude of this problem and its impact on the estimated coefficients.[31] We found that the results were not affected by collinearity.

Results

Twenty-four percent of the men in the sample died during the 9.5 years of follow-up; of those aged 45 to 69 years, 14.4% died; and of those aged 70 to 89 years, 54.2% died. The distribution of person-years at risk and number of deaths according to explanatory variables are given in Table 1. Differentials in mortality by country of origin indicated that mortality, both overall and at younger ages, was higher among individuals of North African origin (Table 2). Mortality was lower among older subjects of Asian origin.

A decline in mortality rates with increasing levels of education was evident; the relationship was stronger in the younger age group. Differentials in mortality by marital status (Table 2) indicated lower odds of dying for married men. These odds were highly significant for the younger age group but not significant for the older one. Among nonmarried men, single men showed the highest odds of dying (1.5 for the total sample), and widowed men show the lowest odds.

Employed men had odds of dying that were about half the odds of those not employed, with larger differences in the younger age group (Table 2). All 3 asset-based measures of socioeconomic position—number of rooms in home, car possession, and household amenities—showed significant mortality declines with improved socioeconomic position, although the differences were weaker in the older age group.

In the younger age group, those classified at the low and middle occupational levels had higher odds of dying (approximately 1.4 and 1.3, respectively) than those at high occupational levels. An inverse association also existed between mortality and income; among those whose monthly wages were in the upper quartile, the odds of dying were about 60% the odds of those in the lower quartile.

In multivariate analyses involving men aged 45 to 69 years, the excess mortality of North Africans became less significant when additional variables were included and was nonsignificant in model 4 (Table 3). Mortality among men of Asian origin, which was not significantly different from that of Europeans in an unadjusted model, became significant with inclusion of additional variables (models 2, 3, and 4). It should be noted that the odds of dying for men of Asian origin relative to the odds for men of North African

TABLE 1—Person-Years (in Thousands), Numbers of Deaths, and Crude Death Rates (per 1000 Person-Years), by Sociodemographic Variables: Israel Longitudinal Mortality Study, 1983–1992

	Person-Years		No. of Deaths		Death Rate	
	Ages 45–69 (n=55 065)	Ages 70–89 (n=17 462)	Ages 45–69 (n=7905)	Ages 70–89 (n=9473)	Ages 45–69	Ages 70–89
Person-years, total	491.2	119.5	...	...	...	...
Status during follow-up						
Alive	449.5	75.9	...	...	...	...
Dead	41.7	43.6	...	...	...	...
Age, y						
45–54	225.4		1551		6.9	
55–64	197.7		3722		18.8	
65–69	69.1		2632		38.1	
70–74		65.3		3825		58.6
75–79		36.2		3279		90.6
80–84		14.2		1747		123.0
85–89		3.7		622		168.1
Origin						
Asia	118.4	19.0	1623	1405	13.7	73.9
Africa	93.8	11.1	1550	921	16.5	83.0
Europe	279.0	89.4	4732	7147	17.0	79.9
Education, y						
0–8	213.0	64.9	4150	5333	19.5	82.2
9–12	174.9	34.8	2600	2638	14.9	75.8
13+	103.2	19.8	1150	1491	11.1	75.3
Marital status						
Married	459.8	98.1	7110	7543	15.5	76.9
Divorced	9.8	1.9	217	144	22.1	75.8
Widowed	11.8	17.8	352	1637	29.8	92.0
Single	9.8	1.7	226	149	23.1	87.6
Employment status						
Worked in preceding year	410.1	33.3	5012	1853	12.2	55.6
Did not work	81.1	86.2	2893	7620	35.7	88.4
No. of rooms in home						
<3	125.7	61.7	2846	5203	22.6	84.3
3	176.9	41.3	2982	3129	16.9	75.8
>3	188.6	16.5	2077	1141	11.0	69.2
Possession of car						
Yes	232.8	22.0	2843	1327	12.2	60.3
No	258.4	97.5	4824	7847	18.7	80.5

origin remained almost constant throughout successive adjustments in models 1 to 4.

The effect of education, although reduced after adjustment, remained highly significant even when all other variables were examined simultaneously (model 4; see Table 3). The effect of marital status remained highly significant after adjustment for employment, education, number of rooms in home, and car possession, and this effect was nonsignificant when household amenities were included in the model. The weakening in the effect of marital status was not due solely to the amenities variables; rather, it was a product of the combined effect of variables included in the analyses (this finding was verified in an additional analysis in which the ordering of variables was altered).

The number of rooms, car possession, and amenities variables all remained significantly associated with mortality in the adjusted models (model 4; see Table 3). The marked effect of employment on mortality remained almost unchanged after adjustment for the other variables (Table 3).

To assess the additional contribution of occupation and income to mortality, we restricted the analysis to men aged 45 to 69 years who were employed in 1983 (or in 1978). Model 5 in Table 3 shows that the large differences in mortality associated with occupation (Table 2) were reduced in multivariate analyses. Marital status had a significant effect, with widowed men having the highest odds of dying (model 5). It is important to note that a separate analysis (results not shown) of employed men including only model 4 variables yielded a strong, significant effect of marital status on mortality. This emphasizes the selective nature of the subgroup of employed men. The effect of amenities remained significant, while that of car possession was no longer significant, after adjustment for income (model 6; see Table 3). Mortality differentials associated with income were substantial after adjustment for all other explanatory variables.

Results of multivariate analyses involving men aged 70 to 89 years are presented in Table 4. As was the case for the younger age group, the effect of North African origin diminished and that of Asian origin increased after all other variables had been controlled (model 4). Other variables that were significantly associated with mortality were employment, possession of a car, amenities, and the number of rooms in the household; the effect of number of rooms became nonsignificant after adjustment for all other variables (model 4).

Discussion

To our knowledge, this study is the first systematic evaluation of sociodemographic mortality differentials among Israeli men. We examined mortality differentials during the period 1983 to 1992, using data compiled by linking a sample of 20% of the 1983 census records to records of deaths occurring during that period. Substantial mortality differentials existed among Israeli men in the 1980s according to ethnic origin, marital status, and socioeconomic position, with the differentials being markedly smaller for men 70 years and older. Our results are based on variables that were ascertained at the census date and hence did not incorporate changes that took place during the follow-up period (e.g., death of a spouse), which have been shown to increase the probability of dying.[32] Nevertheless, the large, well-defined, random sample of the Israeli population; the prospective design; the variety and quality of the data; and the high level of successful linkage achieved make this data set a highly suitable source for investigations of mortality differentials.

Ethnic Origin

Individuals of North African origin evidenced higher mortality rates than men of Asian and European origin. Excess mortality among men of North African origin has been shown in other studies of Israelis, suggesting that it has persisted over time and over all age groups.[25,27] Studies conducted in other countries have also shown mortality and morbidity differentials associated with ethnicity[33]; however, these investigations have compared migrants and indigenous popula-

TABLE 2—Age-Adjusted Odds Ratios of Death: Israel Longitudinal Mortality Study, 1983–1992

	All Men, OR (95% CI)	Ages 45–69, OR (95% CI)	Ages 70–89, OR (95% CI)
Origin (Europe)			
Asia	0.96 (0.91, 1.01)	1.03 (0.97, 1.10)	0.83* (0.79, 0.90)
Africa	1.18* (1.12, 1.25)	1.24* (1.16, 1.32)	1.08 (0.97, 1.20)
Education, y (0–8)			
9–12	0.87* (0.83, 0.90)	0.82* (0.77, 0.86)	0.94 (0.88, 1.01)
13+	0.73* (0.69, 0.77)	0.62* (0.58, 0.67)	0.92 (0.84, 1.00)
Marital status (married)			
Divorced	1.34* (1.17, 1.54)	1.49* (1.27, 1.74)	1.05 (0.82, 1.35)
Widowed	1.14* (1.06, 1.22)	1.35* (1.19, 1.54)	1.04 (0.96, 1.14)
Single	1.53* (1.33, 1.74)	1.63* (1.40, 1.91)	1.27 (0.98, 1.64)
Employed in 1983 (not employed)	0.54* (0.52, 0.57)	0.50* (0.47, 0.53)	0.62* (0.58, 0.66)
No. of rooms in home (<3)			
3	0.87* (0.83, 0.91)	0.85* (0.80, 0.90)	0.89* (0.84, 0.96)
>3	0.74* (0.70, 0.78)	0.71* (0.67, 0.76)	0.78* (0.71, 0.86)
Possession of car (no car)	0.70* (0.67, 0.73)	0.67* (0.64, 0.71)	0.75* (0.69, 0.82)
Household amenities	0.82* (0.80, 0.84)	0.78* (0.76, 0.80)	0.88* (0.86, 0.91)
Occupational category[a] (high)			
Medium		1.29* (1.19, 1.41)	
Low		1.41* (1.31, 1.52)	
Income quartile[b] (1st)			
2nd		0.83* (0.75, 0.91)	
3rd		0.71* (0.65, 0.79)	
4th		0.62* (0.56, 0.69)	

Note. OR = odds ratio; CI = confidence interval. The reference category for each variable is given in parentheses.
[a]Persons employed in 1983 (or in 1978).
[b]Employees with reported wages in the 3 months preceding the census.
*$P < .05$.

tions,[34] whereas in the Israeli case both groups represent immigrants who differ by continent of origin. The adult Jewish population of Israel consists mainly of immigrants from about 100 countries.

Possible explanations offered for the differential in mortality associated with ethnic origin include socioeconomic, sociocultural, and genetic factors.[27,34] Indeed, differences regarding culture and demographic background, as well as genetic markers, were notable among European, Asian, and North African Jews when they immigrated to Israel.[35] Although evidence concerning genetic differences has been presented, it has also been suggested that present-day Jews are the product of common ancestral Jews and the varied populations in which they lived over the centuries.[36,37] Evidence of cultural and socioeconomic differences has been consistent, and a persistent association in the Israeli population between ethnic origin and socioeconomic position has been noted.

For example, individuals of North African and Asian origin have been found to be more likely to belong to lower social classes.[38] This association is evident in our data (e.g., 9% of Asian and North African men had completed at least 13 years of schooling, as compared with 26% of the European group). Our study shows that allowance for the cumulative effect of socioeconomic factors alters the association between mortality and ethnic origin. The excess mortality in Jews of North African origin relative to European Jews was eliminated, and a lower mortality among men of Asian origin relative to European Jews emerged. However, the difference between Asian and North African men remained constant.

Thus, while our results suggest that differences in mortality associated with ethnic origin are strongly related to socioeconomic factors, additional factors also appear to play a role. Among men of Asian origin, the Yemenite group showed a remarkably low mortality rate. While questions regarding misreporting of age among Yemenites have been raised,[39] the general trend observed for Asian men was evident as well when Yemenite Jews were excluded from the analysis. Assessing differentials in cause-specific mortality may provide insights into the pathways through which ethnic origin is associated with mortality. This issue is important for future research.

Marital Status

Our study indicates that significant mortality differentials are associated with marital status. Generally, our results are consistent with those reported in other studies.[40–42] We found that mortality was lowest among married men and highest among single men. Potential causal pathways that have been suggested for these associations include a protective effect of the lifestyle of married men, a selection effect of being married, and the selection effects of remarriage for the widowed and the divorced.[42–44] Although our data do not allow us to distinguish between protection and selection effects, both are likely to contribute to the better health of married people.

Nonetheless, the high mortality among never-married men and the lower mortality among widowed men suggest that the two effects accumulate over the life span. We also found marked differences in mortality between married and widowed men, especially among the younger age group. This differential may be due to what is referred to as "the broken heart syndrome,"[45] according to which mortality among widowed persons is increased, particularly in the first year after bereavement, even among relatively young individuals.

Changes in the economic circumstances associated with the death of a spouse may also contribute to the relationship between widowhood and mortality. However, the observed differences are due only in part to socioeconomic factors. In the younger age group (45–69 years), the effect of marital status remained significant after adjustment for several independent variables, and, among those who were employed, the difference between married and widowed individuals remained significant when all other variables were controlled. It should be noted that similar adjustment yielded a substantial reduction in the difference between single and married men. This finding supports studies reporting on the diminished excess mortality of single men after adjustment.[46]

The definition of marital status we used is the legal one, and hence the effects of cohabitation and separation were not taken into account. Although it is not clear how cohabitation and separation affect health,[47] it seems reasonable that the former reduces the likelihood of mortality, whereas the latter increases it. Thus, given the possibility of misclassification, the actual effect of marital status is seemingly larger than that estimated here.

Socioeconomic Status

We assessed socioeconomic differentials in mortality using a wide range of indi-

TABLE 3—Adjusted Odds Ratios of Death Among Men Aged 45–69 Years: Israel Longitudinal Mortality Study, 1983–1992

	Men Aged 45–69 Years				Employed Men	
	Model 1, OR (95% CI)	Model 2, OR (95% CI)	Model 3, OR (95% CI)	Model 4, OR (95% CI)	Model 5, OR (95% CI)	Model 6, OR (95% CI)
Origin (Europe)						
Asia	1.03 (0.97, 1.10)	0.93* (0.88, 1.00)	0.87* (0.82, 0.93)	0.83* (0.77, 0.89)	0.82* (0.76, 0.89)	0.75* (0.68, 0.83)
Africa	1.24* (1.16, 1.32)	1.11* (1.04, 1.19)	1.02 (0.85, 1.09)	0.96 (0.89, 1.03)	0.93 (0.85, 1.01)	0.85* (0.77, 0.95)
Education, y (0–8)						
9–12		0.82* (0.78, 0.87)	0.92* (0.87, 0.98)	0.97 (0.91, 1.03)	0.97 (0.91, 1.04)	1.02 (0.93, 1.12)
13+		0.63* (0.58, 0.68)	0.74* (0.69, 0.80)	0.78* (0.72, 0.85)	0.81* (0.73, 0.89)	0.82* (0.72, 0.93)
Marital status (married)						
Divorced			1.29* (1.09, 1.51)	1.13 (0.95, 1.34)	1.21 (0.99, 1.47)	1.21 (0.93, 1.59)
Widowed			1.21* (1.06, 1.38)	1.10 (0.96, 1.26)	1.28* (1.09, 1.50)	1.28* (1.02, 1.60)
Single			1.30* (1.11, 1.52)	1.13 (0.95, 1.34)	1.14 (0.93, 1.41)	1.21 (0.94, 1.57)
Employed in 1983 (not employed)			0.55* (0.52, 0.58)	0.57* (0.53, 0.60)		
No. of rooms in home (<3)						
3			0.93* (0.88, 0.99)	0.96 (0.90, 1.03)	0.98 (0.92, 1.05)	0.98 (0.84, 1.08)
>3			0.85* (0.80, 0.92)	0.90* (0.84, 0.97)	0.93 (0.96, 1.01)	0.99 (0.89, 1.10)
Possession of car (no car)			0.82* (0.77, 0.87)	0.88* (0.83, 0.94)	0.86* (0.81, 0.92)	0.96* (0.87, 1.04)
Household amenities				0.87* (0.84, 0.90)	0.87* (0.83, 0.90)	0.89* (0.84, 0.93)
Occupational category (high)						
Middle					1.10 (1.00, 1.20)	1.05 (0.92, 1.19)
Low					1.13* (1.03, 1.24)	1.20* (1.07, 1.35)
Income quartile (1st)						
2nd						0.86* (0.78, 0.96)
3rd						0.80* (0.72, 0.90)
4th						0.76* (0.67, 0.86)
–2 log-likelihood	41823	41638	39888	38047	32752	19688
Model χ^2	3481*	3638*	4076*	3954*	2756*	1345*

Note. OR = odds ratio; CI = confidence interval. See text for model details. The reference category for each variable is given in parentheses.
*$P < .05$.

cators, including education, occupation, income, housing, possession of a car, and household amenities. Substantial differences in mortality were found for each indicator considered (apart from education for the older age group). This accords with an extensive body of research published in the last 30 years that shows social class gradients in mortality and morbidity in all industrialized countries.[3,6–12] Likewise, welfare states with universal access to medical care, including Israel, demonstrate substantial socioeconomic differences in health.[5,6]

Alternative explanations have been proposed for the association between socioeconomic position and mortality. Some have suggested that selection processes operate whereby those in better health are more able to climb the social hierarchy and those who are less healthy drift downward.[48] But selection has been shown to play only a minor role in explaining observed inequalities[49]; furthermore, it is unlikely to make an important contribution in a longitudinal study such as this, particularly in relation to years of education, usually completed in early adulthood, and mortality at the age of 45 years and older. Other explanations for socioeconomic differentials in mortality include the circumstances and lifestyles of different social groups.[5,24]

Educational attainment plays a major role in determining positions in the social hierarchy, and it influences knowledge and attitudes that affect the propensity to follow sensible health practices and thus affect health and longevity.[23] Education has been suggested as preferable to other socioeconomic indicators, such as occupation and income,[50] and has shown strong associations with mortality.[10,51,52] Our study shows this association for the 45- to 69-year age group. We found, however, that with a finer categorization of education, the gradient for Israeli men was smaller than that found in other countries (results not shown): The percentage reduction in mortality per 1-year increase in education was 3.8% among Israeli men, as compared with approximately 8% among US and West European men.[51,52]

Income, which is related to current wealth and standard of living, influences health through complex paths linked with material circumstances, including purchasing power and socioenvironmental exposures, and through its association with education and knowledge.[17,53] Results for the younger age group show that income and education are independent components in relation to mortality.

Furthermore, all of the asset-based indicators (namely, housing, possession of a car, and household amenities) showed a strong effect on mortality. Differences associated with these indicators may reflect differences associated with wealth, or, alternatively, the indicators may be regarded as health promoting and as mediating between wealth and health.[53] Our results do not consistently support any one of these possibilities; after adjustment for income, the effects of car possession and number of rooms were not found to be significant, while the effect of amenities remained substantial.

Participation in the labor force was strongly associated with lower mortality for both age groups. Our measurement of employment reflected the individual's status during the year preceding the census. Among men aged 45 to 69 years, those who were not employed represented a heterogeneous group, including men seeking work,

TABLE 4—Adjusted Odds Ratios of Death Among Men Aged 70–89 Years: Israel Longitudinal Mortality Study, 1983–1992

	Odds Ratio (95% Confidence Interval)			
	Model 1	Model 2	Model 3	Model 4
Origin (Europe)				
Asia	0.83* (0.76, 0.90)	0.80* (0.74, 0.88)	0.78* (0.71, 0.86)	0.74* (0.67, 0.81)
Africa	1.08 (0.97, 1.20)	1.05 (0.94, 1.16)	1.00 (0.90, 1.12)	0.94 (0.83, 1.05)
Education, y (0–8)				
9–12		0.92* (0.86, 0.99)	0.99 (0.92, 1.07)	1.03 (0.96, 1.12)
13+		0.89* (0.81, 0.97)	1.01 (0.92, 1.11)	1.05 (0.95, 1.16)
Marital status (married)				
Divorced			1.01 (0.78, 1.31)	0.96 (0.74, 1.25)
Widowed			1.01 (0.93, 1.11)	0.95 (0.87, 1.05)
Single			1.24 (0.95, 1.61)	1.13 (0.86, 1.49)
Employed in 1983 (not employed)			0.64* (0.59, 0.68)	0.65* (0.60, 0.70)
No. of rooms in home (<3)				
3			0.94 (0.87, 1.01)	0.95 (0.89, 1.03)
>3			0.88* (0.79, 0.97)	0.91 (0.82, 1.02)
Possession of car (no car)			0.84* (0.77, 0.92)	0.91* (0.79, 0.95)
Household amenities				0.91* (0.88, 0.95)
–2 log-likelihood	23 096	23 087	22 140	20 896
Model χ^2	985*	994*	1 172*	1 161*

Note. The reference category for each variable is given in parentheses. See text for model details.
*$P < .05$.

men participating in vocational training, chronically ill individuals, and retired men. While the association between unemployment and health has been documented before,[21] this may not have been the only influence operating in the study population, in which unemployment was relatively low during the period under consideration. Also, most men seeking work belonged to the younger age group; hence, selection may have contributed to the observed differences.

Differentials Among the Elderly

Among men aged 70 to 89 years, there was a consistent, marked narrowing in mortality differentials over all sociodemographic indicators (apart from ethnicity). Several other studies have shown a reduction, albeit smaller than that observed here, in mortality differentials at older ages.[9,24,49,54] Selective mortality is one interpretation of the narrowing differential; that is, only the most healthy individuals from subgroups in which the likelihood of mortality at a relatively early age is high are still alive at a later age.

Another plausible explanation is differential recruitment of individuals into institutions such as nursing homes, where nonmarried or less advantaged individuals are more likely to be institutionalized. Such selective processes were identified in this sample. Residents in institutional care were excluded from the study population.[28] Moreover, our results reflect both cohort and age effects, which cannot be disentangled in the study under consideration. Clearly, among the cohort of Israelis who were aged 70 to 89 years at the time of the census (especially those of European origin), the experiences associated with World War II were unique.

We found weak associations between education and mortality among the elderly members of the study population. This supports earlier findings for American men,[10] as well as a number of geriatric studies,[55,56] but contradicts more recent findings indicating strong mortality differentials by education that persist after adjustment for income.[51,54] Part of the explanation for this discrepancy probably relates to the smaller differences found among older Israelis with respect to all measures considered and to the smaller inequality according to education found among the younger age group relative to that of other industrialized countries.

While we have demonstrated a reduction in inequality associated with increased age, the differences remain substantial for asset-based indicators: number of rooms in home, possession of a car, and household amenities. There was a significant effect for the latter 2 indicators after other variables had been controlled. This result is in agreement with studies reporting on the association between disposable household income and health,[57] and it confirms the finding that the effect of last occupation before retirement on mortality mainly involves family assets. In addition to wealth, car possession among the elderly may reflect health; a certain level of fitness is required to obtain and maintain a driving license.

In conclusion, some sectors of Israeli society were associated with a higher risk of death than others, including men who were poor, less educated, unmarried, unskilled, not in the labor force, and of North African origin. Adjustment for socioeconomic status eliminated the excess mortality among North African men. □

Contributors

O. Manor, Z. Eisenbach, and E. Peritz planned and initiated the study and obtained grant funding. O. Manor and Z. Eisenbach wrote the paper and carried out the statistical analysis. Y. Friedlander discussed ideas and interpretations of the findings and contributed to the final version.

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