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Differences in Mortality Rates between Haredi and Non-Haredi Jews in Israel in the Context of Social Characteristics

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Research indicates that mortality rates are lower among the religious. Israeli ultra-orthodox Jews, called Haredim, have characteristics distinguishing them from the rest of the Jewish population in Israel. These include lower socioeconomic status, higher fertility rates and rates of young marriage, and isolation from the general population. Our retrospective cohort study aims to determine the difference in mortality rates between Haredi and non-Haredi Jews in Israel. We collected data on sociodemographic variables, religious lifestyle, and all-cause mortality for 1,230,636 Jewish Israelis (62,674 Haredim) between 1996 and 2016. Using Cox regression and adjusted Kaplan-Meier curves, we constructed models to evaluate the relationship between identifying as Haredi and mortality. The mortality rate was significantly lower among the Haredi population compared to the non-Haredi population (5.0 percent vs. 8.2 percent). After adjusting for sex, age, marital status, number of children, education, and socioeconomic status, we still found a higher mortality rate among non-Haredim compared to Haredim (HR = 1.596; 99 percent CI = 1.519, 1.678). While causal mechanisms could not be analyzed in this study, a likely cause is increased social, psychological, and religious resources, highlighting the need to consider factors other than socioeconomic status when studying religious and other groups with other forms of capital.

Keywords: *mortality, Haredi, Jewish, Israel, social determinants of health.*

INTRODUCTION

It is widely accepted that social determinants, such as socioeconomic status (SES), education, and culture, significantly affect health (Bambra et al. 2010). Religion is one of the strongest identities in a population and a growing body of evidence support its being considered a major social determinant of health (Chen and Vanderweele 2018). It is important, therefore, to understand the effect of religion on population health in order to create effective healthcare policies and interventions.

However, prior research has disproportionately focused on Christian populations (Koenig, King, and Carson 2012; Oman 2018). Yet, other religions and denominations may have distinctive characteristics and, therefore, may have different health outcomes. An example of this is Haredi (ultra-orthodox) Jews who typically live in enclaves, have a lower SES, have large families, and

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it is more often the woman who is the breadwinner in a household, all of which can be connected to health.

Potential disparities between these populations may lead to a better understanding of religion as a social determinant of health not only among Israeli Jews but among other populations as well. Further, an examination of mortality rates for Haredi Israelis in the context of key demographic factors can deepen the understanding of this relationship. Despite this, however, there has been surprisingly little research about Haredi Jews and in particular a lack of research using more objective health measures, such as mortality. This study investigates differences in mortality rates among Israeli Haredi and non-Haredi Jewish populations.

Background

Religion and Health

The effect of religion on health is complex. On the one hand, religion can promote positive health behaviors, provide a support system for members, and have a beneficial effect on well-being (Bruce et al. 2017; Hill et al. 2007; Jim et al. 2016; Kodzi et al. 2011; Shapiro 2018). However, religion can also be related to negative behaviors, such as anxiety, feelings of religious guilt, and violence (Lee and Newberg 2005).

The relationship between religiosity, such as the nature and intensity of a person's religious beliefs, and health is also complex. One study found better self-rated health and satisfaction among the most religious Israelis (Levin 2013). Another study found that religiosity has a u-shaped relationship with health across a wider range of physical and mental health measures (Brammli-Greenberg, Glazer, and Shapiro 2018). When looking at religiosity as a continuous scale, those in the middle have the worst health outcomes, while those identifying as the most secular or most religious have the best health outcomes. Another study conducted in Israel found that religiosity is related to some positive health behaviors, although no differences were found between religious and secular Israelis regarding the frequency of medical examinations, except for a lower rate of mammograms among religious women (Shmueli and Tamir 2006). A meta-analysis of the relationship between religiosity and quality of life among patients with cardiovascular diseases found some evidence of a beneficial relationship, with certain aspects of religiosity positively associated with a person's quality of life (Abu et al. 2018).

Religion and Mortality

Studies have demonstrated a negative relationship between religiosity and mortality using a variety of measures of religiosity. Specifically, mortality rates are significantly lower among those who identify as religious compared to those who do not (Chida, Steptoe, and Powell 2009). Other studies have found lower mortality rates among individuals reporting religious service attendance or being religiously active compared to individuals reporting no religious service attendance or no religious activity (Bruce et al. 2017; Li et al. 2016; Zimmer et al. 2019). Significantly lower mortality rates have also been found when looking at specific causes of death, such as cancer and cardiovascular diseases (Li et al. 2016).

If religiosity can promote a healthy lifestyle, then understanding its mechanism of action on a person's health has the potential to conserve resources as well as increase the quality of life among the older population. This is especially true given that studies have shown an increase in religious involvement with older age (Zimmer et al. 2016).

There are several possible mechanisms as to why religiosity has a protective effect against mortality (Zimmer et al. 2016). The first is the creation of social support among adherents (Kodzi et al. 2011). Second, as stated above, religion can promote healthy behaviors. These can include

healthy consumption habits, lower smoking rates, and lower alcohol consumption (Hill et al. 2007). Third, religion can provide coping mechanisms for stressful events (Park 2005). Finally, psychosocial responses influenced by religion can be advantageous to one's health. These include (but are not limited to) forgiveness, compassion, and altruism (Zimmer et al. 2016).

The Haredi Community

Ultra-Orthodox Jews, known as Haredim (lit. "those who fear," singular Haredi), are considered the most stringently religious Jews. There are several distinctive characteristics and cultural norms that distinguish the Haredim from other Jewish communities. These include isolation from other communities; strict religious adherence; and hesitancy to adopt modern technology (Friedman 2018).

In 2018, Haredim made up 12 percent of Israel's population. The annual growth rate among Haredim is more than double that of the overall growth rate in Israel, and the median age among them is less than half of the non-Haredi Jewish population in Israel (16 vs. 35, respectively). Fifty-eight percent of Haredim are under the age of 20, compared to only 30 percent among non-Haredi Jews (Malach and Cahaner 2018).

The high growth rate in the Haredi community can be partially attributed to the high fertility rate. Israel has one of the highest fertility rates in developed countries, with an overall fertility rate of 3.11 in 2017 (Birnbaum et al. 2010; The World Bank 2019). Haredim have the highest birth rate of all Jewish denominations in Israel, with over seven children per woman. When looking at religiosity as a spectrum among Israelis, starting with the most religious, there is a clear downward trend for birth rates (Malach and Cahaner 2018; Weinreb and Balas 2018).

Another contributing factor to the high growth rate is the high rate of marriage at a relatively young age. Religion sanctifies the values of marriage and family, and in both Jewish and Muslim communities in Israel, there is a positive relationship between religiosity level and marriage rate (Mahoney et al. 2003; Okun 2013). However, in recent years, there has been a trend of later marriages (after the age of 30) among Haredim (Malach and Cahaner 2018).

The Haredi community is also characterized by a lower average SES than non-Haredim. The average income for Haredim was almost 35 percent lower than that of the non-Haredim in 2016, and around 45 percent of Haredi families live under the poverty line as compared to 11 percent among non-Haredi families (Malach and Cahaner 2018). Additionally, the number of individuals in the Haredi community receiving a college degree is substantially lower than that of the non-Haredi community in Israel (Regev 2014).

Finally, the isolation of Haredim from external influences is another defining characteristic of the community and greatly impacts their choice of residence. Most Haredim will choose to live in isolated ultra-orthodox communities, or enclaves, in larger cities or in cities with a Haredi majority and that comply with Haredi social norms, such as modest dress and internet bans (Flint, Benenson, and Alfasi 2012; Rosen and Razin 2008).

Sociodemographic Factors and Mortality

Mortality rates are affected by both age and sex. In an area with an older population, mortality rates will be higher than an area with a younger population (Salinari and De Santas 2015). Mortality rates also differ by sex; as has been well documented, with women having a higher life expectancy than men (Barford et al. 2006; Elo et al. 2018). In Israel, life expectancy for women was 84.2 between the years 2013 and 2017, while for men it was 80.4 (Kornilenko 2019).

Previous studies have found lower mortality rates among married individuals compared to unmarried individuals (Tatangelo et al. 2017). This finding was demonstrated in studies conducted both in Europe and North America, although not in studies conducted in Israel or other Asian

countries (Manzoli et al. 2007). Parents have a higher life expectancy compared to childless individuals, though the mechanisms of this association are unknown (Grundy and Kravdal 2008; Hurt 2006; Modig et al. 2017). The protective effect of children has been found to be similar both among men and women (Grundy and Kravdal 2008). While some studies show an increasing protective factor among women as fertility increases, others demonstrated a loss of protective effect for women with four or more children (Hurt 2006; Konishi, Ng, and Watanabe 2018).

Many studies show that SES affects mortality; specifically, that among higher income levels, mortality rates are lower (Brodish, Henry, and Jahn 2016; Chetty et al. 2016; Marmot 2002; Pickett and Wilkinson 2015). There is a causal relationship between the two (Pickett and Wilkinson 2015). The strength of the relationship and its longevity differ among populations and studies have shown that this association is stronger among men compared to women (Chetty et al. 2016; Mustard and Etches 2003). Similarly, research has found that higher education is associated with lower mortality rates (Byhoff et al. 2017; Lleras-Muney 2005; Regidor et al. 2016). Mortality risk for individuals in neighborhoods with a lower SES is higher in comparison to the mortality risk for individuals in neighborhoods with higher SES (Meijer et al. 2012). Additionally, an increase in cancer and cardiovascular disease (CVD)-related mortality has been found to be associated with neighborhoods with lower SES (Major et al. 2010). Urban density also has a negative impact on mortality risk (Beenackers et al. 2018; Meijer et al. 2012). Research on the effect of residential segregation or clustering, the degree to which a categorized group of people (such as by ethnicity, race, or religion) live in a specific area within a city, on health and mortality is inconclusive. Some studies show that residential segregation is detrimental for health, while others show that clustered isolation could provide a protective factor (Kramer and Hogue 2009). A study conducted in the United States found better perinatal outcomes (lower mortality and higher birth weight) among Blacks who lived clustered together (Bell et al. 2006).

Research Objective

Although typically those who are more religious have longer lifespans, there are a number of sociodemographic factors which are both distinctive among Haredim and also associated with mortality in both directions, as described above. As a result, we may expect differences in mortality rates among Haredim compared to other religious groups and compared to less religious Jews. Despite this, there has been insufficient research about mortality among Haredi Jews. To address this sparsity of research with potentially important implications, this study investigates differences in mortality rates between Israeli Haredi and non-Haredi Jewish populations.

Methods

This retrospective cohort study for all-cause mortality utilized data gathered from the Israel Population Registry, Education Registry, Ministry of Health, and Israel Central Bureau of Statistics (CBS). The cohort included 1,230,636 Jewish Israeli citizens and was conducted between 1996 and 2016. The data for this study were gathered and combined by CBS, and the data analysis was conducted in the CBS research room.

This study was approved by the Ethics Committee of the Population Registry, Tax Authority, and CBS. All statistical analyses extracted from the CBS research room were approved as meeting ethical standards.

Study Population

The study population (Haredi Israeli Jews) included 62,674 people born during 1940−1960, who live in cities of 18,000 or more and were identified by us as Haredi. The control group

(non-Haredi Israeli Jews) included 1,167,962 Jewish Israelis born during 1940−1960, who live in cities of 18,000 or more and were identified by us as non-Haredi. Non-Jewish Israelis were not included in the comparison group because there are no data available from the data sources of this study regarding the level of their religious observance. Additionally, comparing Jewish populations enabled us to keep religion as a constant factor, thus improving validity.

Research Variables

The variables year of birth, sex, and year of immigration to and/or emigration from Israel were obtained from the Population Registry. Marital status at the beginning of the follow-up period, as obtained from the Population Registry, was converted into a dichotomous variable in which "single," "divorced," and "widowed' were defined as "unmarried." The number of children, as obtained from the Population Registry, was converted into a dichotomous variable: 0–3 children/4 and more children. The reason for this particular division is twofold. First, the average number of children per woman in Israel is around 3, so the study focuses on those families with above average number and below average number of children. Second, based on the previous literature, the protective effect of children seems to decrease after four children (Hurt 2006).

Identifying the individual as Haredi was done using two variables from the CBS. One variable, the degree of Haredi homogeneity on the street of residence, was built on the basis of voting data for the Knesset (Israeli parliament) in 2006, 2009, and 2013 (Gorevitz and Coehn-Castro 2004). The second variable, the degree of religiosity based on educational institutions attended, was built on the level of religiosity of the educational institution in which the individual, the spouse of the individual, or the children of the individual were involved in as students or teachers since 1991, based on a method developed by Haim Portnoy (Portnoy 2007).

Participants whose last residential street was identified as one of high Haredi homogeneity (at least 70 percent of voters gave their votes to ultra-orthodox parties) and/or who, according to the Portnoy matrix, were involved as students or as teachers in ultra-orthodox educational institutions since 1991 were identified as Haredi.

The education level of each person was constructed using data obtained from the Education Registry, managed by the CBS, and based on education data from different sources, such as academic institutions, Ministry of Education, sample surveys, and censuses. From this registry, we obtained the total years of general education and the highest education certificate obtained. The total years of education years were classified into three categories: high—15 years of education or more; intermediate—11–14 years of education; and low—up to 10 years of education. In addition, we added a dichotomous variable: has at least a certificate of matriculation after high school (called a te'udat bagrut in Israel), or does not have a certificate of matriculation.

SES was determined by place of residence during 2017 or during the last year of life and was based on the 2015 socioeconomic index of the community of residence, obtained from the CBS. This index is constructed from 14 variables: median age, average monthly income per capita, rate of motorization, dependency ratio, percent of families with four or more children, average years of schooling (ages 25–54), percent of wage and income earners—above twice the average wage, average vehicle license fee, percent of women aged 25−54 with no income from work, percent of recipients of income support and income supplement to old-age pension, average number of days abroad, percent of wage and income earners, of aged 15 and over, and percent of degree holders (ages 25–54) (The Central Bureau of Statistics 2019). Socioeconomic levels of community of residence were classified on a scale of 1–10. We categorized this variable into low (1–5), middle (6–7), and high (8–10) SES. The dependent variable for this study, mortality, was obtained from the Population Registry, based on data from the Ministry of Health and death certificates.

Statistical Analyses

We first examined the distribution of the following variables by Haredi versus non-Haredi: sex, age, marital status, number of children, education level, certificate of matriculation received, and community SES level. A Chi-square test was used to compare frequency distributions of categorical variables and *t*-test was used for age.

Second, mortality rates were examined with respect to the variables Haredi/non-Haredi, sex, marital status, number of children, education level, certificate of matriculation received, and community SES level. Adjusted hazard ratios (AHRs) for mortality, after adjusting for age and/or sex, were used to compare mortality rates between groups.

Because of a relatively high rate of missing information for certificate of matriculation or higher, (22.3 percent), and a high correlation between this variable and the educational level, we decided not to include the certificate of matriculation variable in the models in the remainder of the analysis.

Third, using Cox regression and adjusted Kaplan-Meier curves, we constructed models to evaluate the relationship between identifying as Haredi and mortality. Effect estimates are presented as hazard ratios (HRs) and 99 percent confidence intervals (CIs) of death associated with being identified as Haredi or with other covariates.

In model 1, we included sex and age in addition to whether or not they are identified as Haredi.

In model 2, we included sex, age, marital status, and number of children in addition to being identified as Haredi.

In model 3, we included sex, age, education, and SES by residential area in addition to being identified as Haredi.

In model 4, we included sex, age, marital status, number of children, education, and SES by residential area in addition to being identified as Haredi.

There was no mortality information for people who emigrated from Israel during the study period and did not return by the end of the study period. For the purposes of this study, these individuals were considered censored and contributed to the number at risk in the survival analyses until the year they left Israel. The life-years contributed were included as is common when conducting survival analyses in order not to lose the life-years contributed to the study prior to their departure (Leung, Elashoff, and Afifi 1997).

All statistical analyses were conducted using SPSS version 23.0

Results

Demography

The study population included 1,230,636 Jewish Israelis with 62,674 (5.2 percent) Haredim and 1,167,962 (94.9 percent) non-Haredim. The percentage of women in the non-Haredi population was higher (51.0 percent) than in the Haredi population (47.2 percent) ($p < .001$). The non-Haredi population was older, more educated, and lived in residential areas of higher SES. Additionally, the non-Haredi population had a lower proportion of married individuals at the beginning of the study period and a lower number of children compared to the Haredi population ($p < .001$) (Table 1).

Mortality Rates

The overall all-cause mortality rate during the study period was 8.0 percent. Examination of the distribution of all-cause mortality rate by study variables showed that this rate was higher

Table 1: Distribution of study variables by religiosity level (Haredi and non-Haredi) among total population ($n = 1{,}230{,}636$)

		Haredi $N = 62{,}674$ (5.1%)	Non-Haredi $N = 1{,}167{,}962$ (94.9%)	p-exact sig (two-sided)	Percentage missing
Women		47.2%	51.0%	<.001	.00%
Average age at beginning of follow-up period (s.d)		43.71(5.47)	45.23(5.65)	<.001	.00%
Married at beginning of follow-up period		90.4%	74.5%	<.001	. 1%
Number of children	4 and more	74.3%	19.7%	<.001	.00%
Educational years	15 and more	18.3%	32.8%	<.001	19.8%
	11–14	68.2%	44.5%		
	Up to 10	13.5%	22.7%		
Has at least a certificate of matriculation	Yes	31.9%	53.8%	<.001	22.3%
Socioeconomic status by residential area	8–10	5.7%	26.4%	<.001	.00%
	6–7	15.4%	37.9%		
	1–5	78.9%	35.7%		
Total number of life-years contributed during the follow-up period		1,282,166	22,753,114		
Mean per person of life-years contributed during the follow-up period		20.458	19.481		
Total number of deaths during the follow-up period		3,147	95,267		
Mortality rate per 100,000 person-years		245.444	418.696	<.001	
Mortality rate during the follow-up period		5.0%	8.2%	<.001	

among the non-Haredi population compared to the Haredi population (8.2 percent vs. 5.0 percent, respectively), and statistically significant even after adjusting for age and sex (AHR = 1.565, 99 percent CI = 1.494, 1.640). Similarly, a higher mortality rate was observed after adjusting for sex and age among those who were not married at the beginning of the study period, compared to those who were married (AHR = 1.336; 99 percent CI = 1.312, 1.361). No statistically significant relationship was found between the number of children and mortality rates.

When examining the role of the socioeconomic variables in predicting mortality after adjusting for sex and age, the mortality rates were higher among people with low education levels (AHR = 2.005; 99 percent CI = 1.956, 2.055) and intermediate levels of education (AHR = 1.357; 99 percent CI = 1.325, 1.389) compared to those with a high level of education. Likewise, higher mortality rates were found among those living in a low-SES residential area (AHR = 1.313; 99 percent CI = 1.285, 1.342) and middle SES area (AHR = 1.139; 99 percent CI = 1.114, 1.165) compared to high SES residential areas (Table 2).

Multivariable Models to Evaluate the Relationship between Haredi and Mortality

We used multivariable Cox models to evaluate the relationship between whether or not one was identified as Haredi and mortality among all 1,230,636 participants in the study population. A higher mortality rate was found among non-Haredim compared to Haredim (HR = 1.590; 99 percent CI = 1.516, 1.685) after adjusting for sex, age, marital status, and number of children (model 2, Table 3). Additionally, a higher mortality rate was found among non-Haredim compared to Haredim (HR = 1.754; 99percent CI = 1.670, 1.841) after adjusting for sex, age, education, and SES by residential area (model 3, Table 3). Finally, after adjusting for sex, age, marital status, number of children, education, and SES by residential area, we found a higher mortality rate among non-Haredim in comparison to Haredim (HR = 1.596; 99 percent CI = 1.519, 1.678) (model 4, Table 3).

In addition, we used a Kaplan-Meier survival curve to compare mortality rates by sex. We found higher mortality rates among non-Haredim compared to Haredim among both men (AHR = 1.630, 99 percent CI = 1.532, 1.734) and women (AHR = 1.532, 99 percent CI = 1.408, 1.666) after adjusting for age, marital status, number of children, educational years, and SES by residential area (Figure 1).

Discussion

This study examined mortality among the Haredi community in Israel and compared it to other Jewish Israelis. The overall all-cause mortality rate during the study period among the 1,230,636 participants in the study was 8.0 percent. A lower mortality rate was found among Haredim compared to non-Haredim in all multivariate models that we produced, including those adjusting for key demographics and measures of SES.

These results are similar to many other studies, in that those who are more religious typically have lower mortality rates compared to those who are less religious (Koenig, King, and Carson 2012; Oman 2018). However, the target population for this study, Haredim, has generally been a difficult population to study and there are large gaps in knowledge about their health (Rier, Schwartzbaum, and Heller 2008; Simhi et al. 2019).

While there have been some studies about Haredi health in Israel which have found being Haredi associated with positive health outcomes, these have focused on morbidity (Levin 2011, 2013). While related, mortality and morbidity can be very different both epidemiologically as well as in terms of significance (Hernandez and Kim 2020). For example, there are factors that can affect mortality and not morbidity and vice versa. Therefore, although well-being and other health outcomes have been studied in the Haredi community, these cannot serve as a predictor

Table 2: Distribution of mortality rates by study variables

			Non-Adjusted Hazard Ratio (NAHR)		Adjusted Hazard Ratio (AHR)	
		% Mortality	NAHR (99% CI)	*p*	AHR (99% CI)	*p*
Total		8.0%				
Religiosity level	Haredi	5.0%	1.00		**1.00	
	Non-Haredi	8.2%	1.753 (1.673–1.836)	<.001	**1.565 (1.494–1.640)	<.001
Sex	Female	6.3%	1.00		*1.00	
	Male	9.8%	1.614 (1.588–1.642)	<.001	*1.629 (1.602–1.657)	<.001
Marital status	Married	7.6%	1.00		**1.00	
	Unmarried	9.2%	1.277 (1.254–1.301)	<.001	**1.336 (1.312–1.361)	<.001
Number of children	0–3	7.9%	.985 (.966–1.004)	=.039	**.997 (.978–1.017)	=.703
	4 and more	8.4%	1.00		**1.00	
Educational years	15 and more	5.7%	1.00		**1.00	
	11–14	7.8%	1.327 (1.296–1.358)	<.001	**1.357 (1.325–1.389)	<.001
	Up to 10	12.7%	2.224 (2.170–2.279)	<.001	**2.005 (1.956–2.055)	<.001
Has at least a certificate of matriculation	Yes	6.7%	1.00		**1.00	
	No	9.4%	1.364 (1.338–1.390)	<.001	**1.344 (1.319–1.369)	<.001
Socioeconomic status by residential area	8–10	6.9%	1.00		**(1.00)	
	6–7	7.9%	1.120 (1.096–1.146)	<.001	**1.139 (1.114–1.165)	<.001
	1–5	8.8%	1.265 (1.238–1.293)	<.001	**1.313 (1.285–1.342)	<.001

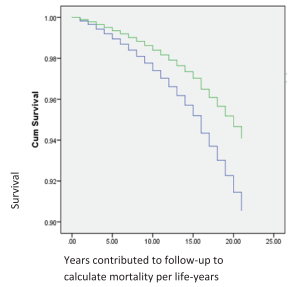
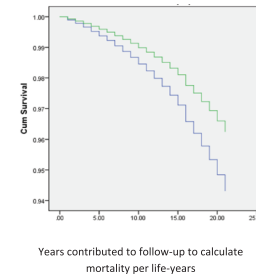
*= Age adjusted hazard ratio.
**= Age and gender adjusted hazard ratio.
NAHR (non-adjusted hazard ratio) and AHR (adjusted hazard ratio) (n = 1,230,636).

Table 3: Results of Cox models for predicting mortality by social variables within the total study population ($n = 1{,}230{,}636$)

		Model 1		Model 2		Model 3		Model 4	
		HR (99% CI)	*p*	HR (99% CI)	*p*	HR (99% CI)	*p*	HR (99% CI)	*p*
Religiosity level	Haredi	1.00		1.00		1.00		1.00	
	Non-Haredi	1.565 (1.494–1.640)	<.001	1.590 (1.516–1.685)	<.001	1.754 (1.670–1.841)		1.596 (1.519–1.678)	<.001
Sex	Female	1.00		1.00		1.00		1.00	
	Male	1.634 (1.606–1.661)	<.001	1.657 (1.630–1.685)	<.001	1.710 (1.679–1.743)		1.786 (1.753–1.820)	<.001
Age		1.094 (1.092–1.095)		1.094 (1.092–1.096)		1.092 (1.090–1.094)		1.093 (1.091–1.095)	<.001
Marital status	Married			1.00				1.00	
	Unmarried			1.348 (1.323–1.373)	<.001			1.529 (1.495–1.563)	<.001
Number of children	0–3			.890 (.872–.908)				1.131 (1.107–1.156)	<.001
	4 and more			1.00				1.00	
Educational years	15 and more					1.00		1.00	
	11–14					1.371 (1.339–1.404)	<.001	1.417 (1.384–1.451)	<.001
	Up to 10					1.949 (1.901–1.998)	<.001	2.029 (1.978–2.081)	<.001
Socioeconomic status by residential area	8–10					1.00		1.00	
	6–7					1.056 (1.030–1.082)	<.001	1.065 (1.039–1.092)	<.001
	1–5					1.243 (1.213–1.274)	<.001	1.253 (1.222–1.284)	<.001

Figure 1
Analysis of mortality rates among Haredi compared to non-Haredi separated by sex, adjusted for age, marital status, number of children, educational years, and socioeconomic status by residential area [Color figure can be viewed at wileyonlinelibrary.com]

Non-Haredi ——— , Haredi ———

	Men			Women		
	N	Kaplan Meier survival curve	AHR (99% CI)	N	Kaplan Meier survival curve	AHR (99% CI)
Total population	624,901		1.630 (1.532-1.734) p<0.001	605,735		1.532 (1.408-1.666) p<0.001

for mortality. The current study, therefore, makes an important contribution in understanding mortality among Haredim.

Further, there are problematic aspects to using self-reported health information as an outcome from Haredim as is commonly done in morbidity studies involving Haredim (Brammli-Greenberg, Glazer, and Shapiro 2018). The self-reports reflect subjective opinions that can also be affected by factors, such as social norms, and therefore, there may be biases especially among Haredim (Rier, Schwartzbaum, and Heller 2008). This study's outcome measure is mortality, a commonly used and important objective measure of health, which can potentially overcome these biases (World Health Organization 1998).

Consistent with our findings, Chernichovsky and Sharony (2015) did examine mortality for Haredim and found lower mortality rates for this population. However, their study was limited in identifying mortality only at the ecological level, describing mortality for three Israeli cities with large Haredi populations. Additionally, the study was not able to control for confounding variables, such as SES and family size.

Studying mortality among Haredim in a retrospective study is challenging because methods often used in studying morbidity, such as self-identification, are not possible. The current study goes beyond any earlier research about Haredi mortality in innovatively collecting and combining data from four different sources over an extended period of years to enable individual-level identification of Haredi Jews. It used residence by streets, not just city, and included not just the largest cities but all cities in Israel with at least 18,000 residents. Additionally, the study used education as another marker for being Haredi as there are distinctive education characteristics among Haredim, especially males, who often receive many years of religious education but minimal formal secular education. While not without limitations, we think this methodology served to greatly increase the validity of determining mortality rates for Haredim. We think this methodology could be of value for future studies of Haredim when self-report is not available of advisable.

Although as noted, other religious groups typically have lower mortality rates, it is still somewhat surprising that Haredim have longer lifespans than non-Haredim, given some of their distinctive demographic and lifestyle characteristics. Haredim typically have lower income, greater unemployment, and less secular education than other Israelis (Malach and Cahaner 2018), all of

which are associated with higher mortality rates (Berkman, Kawachi, and Glymour 2014). In addition, Haredi Jews often live in insular enclaves (Rier, Schwartzbaum, and Heller 2008; Rosen and Razin 2008). This can sometimes be associated with worse health outcomes (Kramer and Hogue 2009). However, even on an unadjusted basis, Haredim had lower mortality rates compared to non-Haredi Israelis.

Furthermore, Haredim have highly defined gender roles that may be associated with mortality, and which can be more stressful for women compared to other groups. For example, Haredi women carry an exceptional burden of raising a child-centered family, have high fertility rates, the burden of running a household with great demands for hospitality and religious observances, all while leaving home for work while the husband is studying Jewish religious texts all day in a yeshiva.

However, despite all the factors mentioned, our study found lower mortality overall among Haredim compared to less religious Israelis and lower mortality rates among women than men. Further, even when stratified by sex, mortality rates were lower among Haredim compared to non-Haredim. It can be hypothesized that family might be an explanatory factor in the relationship between being Haredi and lower mortality. Being married can be a protective factor (Tatangelo et al. 2017) and children can sometimes be a protective factor. However, even after adjusting for family variables that include marital status and number of children, the relationship between being Haredi and lower mortality remained stable.

Therefore, alternative explanations are needed to explain the lower mortality found among Haredim. While the causal mechanisms for this finding could not be directly analyzed in this study, a likely cause is increased social capital. Although there are a number of definitions of social capital, it typically involves accumulation of social resources that inhere in social relationships with elements of trust and reciprocity among those in a social network that can bring increased resource and concomitant benefits (Putnam 2000).

Religion is thought to be a major source of social capital (Idler 2014; Putnam and Campbell 2010) and has been found related to better health outcomes, including lower mortality (Berkman, Kawachi, and Glymour 2014; Ferlander 2007; Oman 2018). Our study found that Haredim have larger families, which are an important source of social capital (Prandini 2014). Related to this, Haredim often receive formal and informal support from extended family and neighbors, such as caring for the sick, helping women who give birth, comforting the bereaved, and so on.

While our study could not directly measure other forms of social capital, Chernichovsky and Sharony (2015) found greater characteristics of social capital found among Haredim compared to other Israelis and attributed the lower mortality largely to this factor. Another study found social capital to be an important influence among Haredim (Malchi and Ben Porat 2018). An important element of social capital is trust and an increasing phenomenon of trusted Haredi Rabbis who become expert in the health care system and refer people to appropriate health care providers (Coleman-Bruckheimer et al. 2009). Recent research has also found that prioritizing a sense of community, another important element of social capital, was positively associated with well-being among Haredi Jews (Russo-Netzer and Bergman 2020).

There are also psychological/personality traits that are both distinctive to religion and associated with better health outcomes. For example, greater rates of volunteering have been found among those who are religious, including Haredim (Malchi and Ben Porat 2018; Putnam and Campbell 2010); this is also related to better health outcomes (Jenkinson et al. 2013). Greater religious involvement can be associated with optimism and positive emotions, which are associated with better health (Idler 2014; Koenig, King, and Carson 2012). Haredi Israelis have been found to have great optimism than other Israeli groups, such as higher expectations for improvement in the future (Kasir and Romanov 2018).

Beyond social and psychological factors, the specific content of religion itself can potentially influence health. There are distinctive aspects of religion, such as beliefs, behaviors, rituals, and perspective, that can serve as resources (Finke and Dougherty 2002; Iannaccone 1990, 1994;

Stark and Finke 2000). The term "Religious Capital" was developed to describe these aspects of religion. For example, the statement in the Torah (Hebrew Bible) that one must take care of one's self can be a religious teaching. Although religious capital has rarely been examined in terms of its relationship with health outcomes, there does seem to be some evidence of a relationship between greater religious capital and better health (Holt et al. 2011; Shapiro and Sharony 2019). Further, a stricter interpretation of tradition supports the idea that there is greater religious human capital found among Haredi Jews (Iannacone 1990).

These social, psychological, and religious mechanisms have been found to be related to health characteristics associated with lower mortality, such as better health behaviors and health status. For example, Haredim typically have better physical and mental health (Brammli-Greenberg, Glazer, and Shapiro 2018; Muhsen et al. 2017). They also have a less risky lifestyle, which may lead to lower mortality: they smoke less, take fewer harmful drugs, and have less traffic accidents (Coleman-Brueckheimer and Dein 2011). However, the extent to which the lifestyle is less risky can vary by type of behavior and can be subject to reporting biases.

There are important policy implications to these findings. In recent decades, great attention has been paid to socioeconomic inequalities as a very important social determinant of health (Berkman, Kawachi, and Glymour 2014; Link and Phelan 1995). However, our study found that despite low SES, mortality among Haredim was lower than non-Haredi Jews in higher SES groups, on both an adjusted and unadjusted bases. Differences in health care access because of SES are not likely to be the major reason for the mortality differences because Israel has universal health insurance and the health funds provide a uniform basic basket of services to all citizens, although there is supplementary private insurance available at a cost (Rosen, Waitzberg, and Merkur 2015).

While SES is indeed an important driver of health (Berkman, Kawachi, and Glymour 2014), it appears that factors not necessarily related to SES, such as religion, can also be an important social determinant of health (Idler 2014), and greater social, psychological, and religious resources can potentially overcome the negative effect of low SES.

There are also implications for groups that are less religious. More attention should be paid to increasing sources of capital other than SES. For example, it may be possible to increase social capital among groups that are in a difficult socioeconomic situation in order to potentially neutralize the effect of the relationship between socioeconomic status and health.

Limitations/Additional Research

Although we think the definition of Haredim used in this study has greater validity than that used in prior studies for the reasons noted, it is still imperfect and it is possible that there is some miscategorization of study participants, although the extent of this cannot be determined.

This study focused on mortality in Israel. If any Israelis emigrated during the study period, they would not be included in mortality statistics. To the extent that emigration rates and health characteristics of emigrants differ between Haredim and non-Haredim, this could potentially affect results.

We were unable to separate the non-Haredi population into secular and orthodox Jews, which may have further strengthened the outcomes of the study were we to find lower mortality rates among orthodox (though not Haredi) Jews. Furthermore, we do not have data about Haredim who later became non-Haredim but could not be identified as such using our methodology. While we would not expect this to be a large group, it is possible that this could affect results.

It is not clear to what extent this study's findings are generalizable to other religions and other countries, but we expect they will be relevant to at least some extent, to Haredi (Ultra-orthodox) Jews in other countries, as well as to other insular religions with similar lifestyles and characteristics. However, we do not have the data to compare Israeli Haredi mortality rates to other Jewish ultra-orthodox communities around the world. As noted, the causal mechanisms

underlying the relationship between being Haredi and lower mortality are not fully known. More research in this area is needed to more fully examine these mechanisms, building upon this study's findings and hypotheses suggested in this paper.

Conclusion

While there is a large and growing body of literature about the relationship between religion and health, there has been a paucity of research about the health of Haredi Jews, who have distinctive characteristics, such as lifestyle, beliefs, and demographics, which can affect health yet can be challenging to research. This study innovatively used data from four sources to investigate mortality among Haredim in Israel in the context of key sociodemographic factors. It found that mortality is significantly lower among them than for non-Haredi Jews, a somewhat surprising finding given Haredi Jews' typically lower SES. The reasons for this are unclear, although social, psychological, and religious factors all likely play important roles. This study highlights the need to pay attention to factors other than SES when studying religious and other groups who may possess alternate forms of capital. However, more research is needed on the topic.

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