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Lifestyle and reduced mortality among active California Mormons, 1980–2004

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Abstract

Objective. The objective is to measure the relationship of several healthy characteristics of the Mormon lifestyle to mortality.

Method. We examined 9815 religiously active California Mormon adults followed for mortality during 1980–2004 and 15,832 representative U.S. white adults enrolled in the 1987 National Health Interview Survey (NHIS) and followed for mortality during 1988–1997. The standardized mortality ratio (SMR) and 95% confidence interval (CI) was calculated relative to U.S. whites defined to have a SMR of 1.00.

Results. Active California Mormons practice a healthy lifestyle advocated by their religion, which emphasizes a strong family life, education and abstention from tobacco and alcohol. Unusually low SMRs occurred among married never smokers who attended church weekly and had at least 12 years of education. For those aged 25–99 years at entry, the SMR for all causes of death was 0.45 (0.42–0.48) for males and 0.55 (0.51–0.59) for females. For those aged 25–64 years at entry, the SMR for all causes of death was 0.36 (0.32–0.41) for males and 0.46 (0.40–0.53) for females. Life expectancy from age 25 was 84 years for males and 86 years for females. These SMRs were largely replicated among similarly defined persons of all religions within the NHIS cohort.

Conclusions. Several healthy characteristics of the Mormon lifestyle are associated with substantially reduced death rates and increased life expectancy.

Keywords: Epidemiology; Mormons; Lifestyle; Health practices; Mortality; Longevity

Introduction

Previous research has shown that members of The Church of Jesus Christ of Latter-day Saints, more popularly known as Mormons, are a well-defined U.S. population with low risk to mortality (Enstrom, 1975, 1989, Merrill, 2004). There are currently about 12 million Mormons worldwide, including about 6 million in the United States and about 0.8 million in California. They are interesting from a disease prevention standpoint because of Section 89 of the Church "Doctrine and Covenants," known as the "Word of Wisdom" (The Church of Jesus Christ of Latter-day Saints, 1833). This doctrine advises against the use of tobacco, alcohol, coffee, tea, and illegal drugs, and recommends a well-balanced diet. Also, the Mormon religion emphasizes a strong family life and morality and advocates education and good health practices. Religiously active Mormons, specifically those Church members known as High Priests, are of particular interest because they adhere strictly to the Mormon lifestyle and have done so for most or all of their lives. High Priests retain this designation for the rest of their lives.

Other health-conscious religious groups, like Seventh-Day Adventists, and frequent church attenders in general also have substantially reduced mortality rates (Hummer et al., 1999; McCullough et al., 2000). Frequent church attenders were more likely to abstain from smoking, to have good health practices, and to stay married, factors associated with lower death rates. This paper examines active California Mormons and a general population sample in order to obtain new evidence on the relationship of mortality to religious involvement in combination with several basic health practices.

Methods

The characteristics of active Mormons were assessed by a one-time mailing of a four-page UCLA lifestyle questionnaire to each of about 12,000 California

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Table 1
SMRs for all causes of death for entire 1979 active California Mormon cohort and "optimum" subgroup (married never smokers who attended church weekly and had at least 12 years of education), along with subgroups adhering to three additional health practices

Selected subgroups	1980–2004 deaths			
	Males		Females	
	Deaths/subjects	SMR (95% CI)	Deaths/subjects	SMR (95% CI)
Ages 25–99 at entry				
Entire cohort	1897/5223	0.54 (0.51–0.57)	1123/4592	0.61 (0.57–0.65)
"Optimum" subgroup	872/3340	0.45 (0.42–0.48)	777/3811	0.55 (0.51–0.59)
"Optimum" subgroup with Moderate BMI	756/2969	0.43 (0.39–0.47)	602/2988	0.52 (0.47–0.57)
"Optimum" subgroup with Moderate BMI & Reg Phys Act & Proper Sleep	558/2337	0.40 (0.36–0.44)	402/2187	0.47 (0.42–0.53)
Ages 25–64 at entry				
Entire cohort	885/4106	0.40 (0.36–0.44)	601/3950	0.52 (0.46–0.58)
"Optimum" subgroup	543/2951	0.36 (0.32–0.41)	456/3407	0.46 (0.40–0.53)
"Optimum" subgroup with Moderate BMI	460/2613	0.34 (0.30–0.39)	352/2665	0.44 (0.38–0.51)
"Optimum" subgroup with Moderate BMI & Reg Phys Act & Proper Sleep	341/2070	0.32 (0.28–0.37)	243/1974	0.41 (0.34–0.49)

Four lifestyle characteristics defining the "optimum" subgroup: "Never"=never smoked cigarettes; "12+ years"=12+ years of education; "Married"=married; "Weekly"=attend church at least weekly.
Definitions for additional health practices: "Moderate BMI"=moderate body mass index ($20 \le BMI < 30$ kg/m^2); "Reg Phys Act"=regular physical activity (often or sometime engage in active sports, swim, or take long walks or often garden or do physical exercises); and "Proper Sleep"=proper sleep (usually 7–8 h per day) (2).

High Priest households with valid addresses on the Church's computerized membership file as of about December 1, 1979. Responses were received at UCLA in late 1979 from 9815 persons aged 25–99 years (5223 High Priests and 4592 wives) (Enstrom, 1989). The address of subjects was followed by linkage with the California Department of Motor Vehicles driver license records and Internet address databases, such as, PeopleFinders.com.

Deaths from January 1, 1980 through December 31, 2004 were ascertained by repeatedly matching the identifying information of cohort members with the California Statistical Death File and the nationwide Social Security Death File. A total of 1897 male and 1123 female deaths were identified by both sources. Subjects with a known address who were not identified as deceased were assumed to be alive. Based on this follow-up process, only about 2% of the subjects were lost as of January 1, 2005.

To examine persons of all religions within the general U.S. population, use was made of the Cancer Risk Factor Supplement, Epidemiology Study of the 1987 National Health Interview Survey (NHIS) (Hummer et al., 1999). The National Center for Health Statistics (NCHS) provided us with health and lifestyle data collected in 1987 on 22,080 NHIS respondents (NCHS, 1992) and with information about 2617 deaths through December 31, 1997 identified by matching these respondents with the National Death Index (NCHS, 2004). Analysis of mortality from January 1, 1988 through December 31, 1997 was conducted among the 15,872 white subjects initially aged 25–99 years.

Analyses focused on four "optimum" characteristics associated with the active Mormon lifestyle and mortality: married, never smoked cigarettes, attend church at least weekly, at least 12 years of education. These characteristics were also assessed in the NHIS cohort. Additional analyses were done

Table 2
SMRs for all causes of death among the U.S. white subjects in the 1987 NHIS cohort for selected subgroups based on five basic lifestyle characteristics defined in Table 1

Selected subgroups	1988–1997 deaths			
	White males		White females	
	Deaths/subjects	SMR (95% CI)	Deaths/subjects	SMR (95% CI)
Ages 25–99 at entry				
Entire cohort	982/6664	0.90 (0.85–0.96)	1195/9168	0.83 (0.79–0.88)
One characteristic:				
Never (never smoked cigarettes)	255/2280	0.72 (0.63–0.83)	686/4815	0.70 (0.63–0.79)
12+ years (12+ years of education)	560/5226	0.82 (0.75–0.91)	645/6995	0.77 (0.70–0.85)
Married	626/4618	0.82 (0.74–0.90)	350/5114	0.75 (0.66–0.85)
Weekly (attend church at least weekly)	315/1989	0.78 (0.68–0.88)	517/3788	0.70 (0.62–0.79)
Two characteristics:				
Never & 12+ years	154/1959	0.67 (0.56–0.79)	333/3557	0.65 (0.57–0.74)
Never & Married	152/1519	0.63 (0.53–0.74)	180/2725	0.63 (0.53–0.74)
Never & Weekly	93/838	0.60 (0.48–0.74)	344/2425	0.63 (0.55–0.72)
Married & Weekly	215/1587	0.67 (0.58–0.77)	139/2196	0.61 (0.51–0.74)
Three characteristics:				
Never & 12+ years & Married	96/1306	0.58 (0.47–0.71)	88/2223	0.46 (0.37–0.58)
Never & 12+ years & Weekly	52/709	0.54 (0.41–0.71)	173/1775	0.59 (0.50–0.70)
Never & Married & Weekly	61/654	0.51 (0.40–0.66)	84/1419	0.52 (0.42–0.66)
12+ years & Married & Weekly	135/1280	0.65 (0.55–0.78)	76/1840	0.46 (0.37–0.59)
Four characteristics ("optimum"):				
Never & 12+ years & Married & Weekly	36/557	0.47 (0.33–0.64)	41/1169	0.38 (0.28–0.52)
Five characteristics:				
Never & 12+ years & Married & Weekly & Moderate BMI	30/475	0.43 (0.30–0.61)	29/875	0.35 (0.24–0.50)

involving three health practices known to have a substantial relationship to total mortality: moderate body mass index, regular physical activity, and proper sleep (Enstrom, 1989).

The standardized mortality ratio (SMR) and 95% confidence interval (CI) for all causes was calculated for the "optimum" subgroup of active Mormons. Also, SMRs for all causes have been calculated for the full active Mormon and NHIS cohorts, as well as various subcohorts defined by specific lifestyle characteristics and health practices. Calculation of each SMR (observed deaths divided by expected deaths) was done using a survival program developed by Monson (Monson, 1974; Enstrom, 1989). Expected deaths were based on concurrent death rates among U.S. whites.

Results

Basic lifestyle characteristics of the 1979 California active Mormon cohort and the 1987 NHIS cohort are presented in Supplementary file, i.e., Appendix Table 1 for white males and Appendix Table 2 for white females. These tables are limited to persons aged 25–64 years at time of entry and included an "optimum" subgroup within each cohort, defined to be married never smokers who attend church at least weekly and have at least 12 years of education. Given the nature of the active Mormon cohort, these "optimum" characteristics have remained essentially unchanged over time.

Table 1 shows the 1980–2004 SMR for all causes of death by age at entry for the entire active Mormon cohort, the "optimum" subgroup, and the portions of the "optimum" subgroup that adhere to one and three additional health practices. The SMR for the "optimum" subgroup was 0.45 (0.42–0.48) for males and 0.55 (0.51–0.59) for females. The SMRs for those in the "optimum" subgroup with three health practices and aged 25–64 at entry were only 0.32 (0.28–0.37) for males and 0.41 (0.34–0.49) for females.

Table 2 shows the 1988–1997 SMRs for all causes of death for U.S. whites of all religions in the 1987 NHIS Cancer Epidemiology cohort. Results are shown for subgroups with one, two, three, four, and five of the following characteristics: married, never smoked cigarettes, attend church at least weekly, at least 12 years of education, and moderate body mass index. Subjects with the first four characteristics were defined to be the "optimum" subgroup. The SMRs were progressively lower for the subgroups which possessed more of the five characteristics. For the "optimum" subgroup, the SMR was 0.47 (0.33–0.64) for males and 0.38 (0.28–0.52) for females.

To translate these SMR results into life expectancy, the Supplementary file Appendix Table 3 shows abridged life tables for the "optimum" subgroup of active Mormons from age 25 (Anderson, 1999). Males had a life expectancy of 84.1 years, which was 9.8 years greater than that of 1989–1991 U.S. white males. Females had a life expectancy of 86.1 years, which was 5.6 years greater than that of 1989–1991 U.S. white females.

Discussion

The active California Mormons examined in this study, particularly those in the "optimum" subgroup with four basic lifestyle characteristics, had total death rates that are among the lowest ever reported for a cohort followed 25 years. Also, they had among the longest life expectancies yet reported in a well-defined U.S. cohort.

We assessed three factors that could have affected the validity of these low death rates. Ascertainment of deaths was essentially complete based on repeated matches with the California and Social Security death files and the location of almost all of those not known dead. The low death rates were not due to healthy respondent bias because the rates observed during the first 8 years have persisted for 25 years. The death rates were not unique to the active California Mormon cohort because they were largely replicated among all religions in the NHIS cohort in this paper and in an Alameda County, California cohort in an earlier paper (Enstrom, 1989).

The death rates observed among these active California Mormons were largely explained by four basic lifestyle characteristics associated with long-term "regularity of life." These findings suggest a model for substantial disease prevention in the general population. Further examination of the specific impact of individual lifestyle characteristics and health practices is warranted given the magnitude of the mortality effects observed in this study.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at 10.1016/j.ypmed.2007.07.030.

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