

# Banbury Report



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## CANCER INCIDENCE IN DEFINED POPULATIONS

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## Health and Dietary Practices and Cancer Mortality among California Mormons

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Mormons are interesting from an epidemiologic standpoint because their Word of Wisdom, a church doctrine since 1833, advises against the use of tobacco, alcohol, coffee, tea, and addictive drugs and recommends a well-balanced diet, particularly the use of grains, fruits, and vegetables, and moderation in the eating of meat (Enstrom 1975, 1978, 1979 and in prep.). Furthermore, the church emphasizes a strong family life and advocates good health practices in general. The Mormon Church, officially known as The Church of Jesus Christ of Latter-day Saints, has approximately 2.5 million members in the United States and about 4 million members worldwide, including about 400,000 in California and 900,000 in Utah. The focus of this paper is on California Mormons.

Previous research has demonstrated that Mormons have relatively low death rates from cancer and total mortality. Age-specific cancer and total mortality rates and population-at-risk figures centered around 1970 are presented in Table 1 and standardized mortality ratios (SMRs) for major cancer sites are presented in Table 2. In particular, California Mormons have a SMR for total cancer of 65% for males and 81% for females compared with U.S. whites. The most striking findings pertain to the active Mormon males, defined as High Priests and Seventies, who comprise about 20% of all adult Mormon males, no equivalent classification exists for active Mormon females. High Priests are the church leaders, such as bishops, clerks, and patriarchs; Seventies are adult missionaries who proselytize and bring new members into the church. These Mormon men are most likely to adhere to the Word of Wisdom. The 13,880 California active Mormon males (about 80% High Priests and 20% Seventies) at least 35 years of age have a total cancer death rate that is about 50% that of U.S. white males. The results are similar for active Utah Mormon males. Furthermore, the ratio of age-adjusted total death rates for California active Mormon males compared with U.S. white males is 37% for ages 35 to 64 years and 48% for ages 35 years and above. This means that a 35-year-old California active Mormon male has about an 11% chance of dying before the age of 65, whereas a 35-year-old U.S. white male has about a 30% chance of

**Table 1**  
Average Annual Age-Specific Cancer and Total Mortality Rates for California and Utah Mormons and U.S. Whites (Deaths/1000) and Average Annual Population at Risk

	All cancer <sup>a</sup> mortality rates							
	Total mortality rates				Total mortality rates			
	1968-75 California active Mormons	1970, 1975 Utah active Mormons	1968-75 California Mormons	1970 U.S. whites	1968-75 California active Mormons	1970, 1975 Utah active Mormons	1968-75 California Mormons	1970 U.S. whites
<b>Males</b>								
35-44	.34 (10) <sup>b</sup>	.21 (4) <sup>b</sup>	.30 (47) <sup>b</sup>	.50	1.18 (35) <sup>b</sup>	1.21 (23) <sup>b</sup>	1.98 (312) <sup>b</sup>	3.44
45-54	.84 (27)	.72 (18)	.97 (136)	1.72	3.39 (110)	3.12 (78)	4.88 (684)	8.83
55-64	1.66 (42)	1.30 (32)	3.03 (278)	4.98	8.20 (208)	9.25 (228)	13.78 (1263)	22.03
65-74	4.43 (69)	4.67 (92)	6.70 (289)	9.97	22.55 (351)	25.61 (505)	33.66 (1452)	48.10
75-84	11.42 (75)	11.84 (118)	12.76 (190)	15.93	61.66 (405)	68.83 (687)	73.05 (1118)	100.99
85+	13.95 (19)	8.93 (21)	14.53 (43)	17.72	151.20 (206)	139.44 (328)	139.53 (413)	185.52
36-64 <sup>c</sup>	.82 (79)	.65 (54)	1.18 (461)	1.99	3.62 (353)	3.79 (329)	5.80 (2259)	9.74
35+ <sup>c</sup>	1.80 (242)	1.66 (285)	2.41 (983)	3.65	9.63 (1315)	10.09 (1849)	12.91 (5242)	19.41
<b>Total deaths (All ages) e<sub>35</sub> (Years)<sup>d</sup></b>	(243)	(285)	(1075)		(1327)	(1856)	(6460)	
<b>Population at risk (All ages) (35+ Years)</b>					44.6	44.0	41.5	36.5
<b>Females</b>								
35-44			.60 (108)	.62			1.65 (298)	1.93
45-54			1.27 (207)	1.77			3.43 (558)	4.63
55-64			2.91 (308)	3.39			8.56 (908)	10.15
65-74			4.60 (291)	5.55			18.87 (1195)	24.71
75-84			6.83 (197)	9.04			51.39 (1483)	66.99
85+			9.30 (71)	11.27			128.41 (980)	159.80
35-64 <sup>c</sup>			1.38 (623)	1.68			3.92 (1764)	4.83
35+ <sup>c</sup>			2.06 (1182)	2.53			8.57 (5422)	10.91
<b>Total deaths (All ages) e<sub>35</sub> (Years)<sup>d</sup></b>			(1263)				(6109)	
<b>Population at risk (All ages) (35+ Years)</b>					44.9		43.0	
					190,000		91,027,988	
					68,708		40,652,869	

<sup>a</sup>International Classification of Diseases numbers 140-209.

<sup>b</sup>Number of deaths upon which rate is based is given in parentheses.

<sup>c</sup>Age-adjusted by the direct method to the 1940 U.S. population within the stated age interval.

<sup>d</sup>Life expectancy (average remaining lifetime) in years at age 35, calculated by standard abridged life-table method.

Table 2  
SMRs for Selected Cancer Sites for Mormons Compared with 1970 U.S. Whites

Cancer site	ICD <sup>a</sup> number (8th revision)	1968-75		1970, 1975		1968-75		1968-75			
		California active Mormon (> 35 years)	males (2) <sup>b</sup>	Utah active Mormon (> 35 years)	males (1) <sup>b</sup>	California active Mormon (> 35 years)	males (2) <sup>b</sup>	California Mormon (> 35 years)	males (25) <sup>b</sup>	California Mormon females (> 35 years)	
Buccal cavity and pharynx	(140-149)	13	(2) <sup>b</sup>	6	(1) <sup>b</sup>	13	(2) <sup>b</sup>	51	(25) <sup>b</sup>	121	(25) <sup>b</sup>
Esophagus	(150)	0	(0)	40	(5)	0	(0)	45	(15)	61	(8)
Stomach	(151)	75	(19)	84	(26)	75	(19)	67	(51)	93	(51)
Large intestine (colon)	(153)	74	(34)	56	(32)	74	(34)	69	(95)	81	(146)
Rectum	(154)	37	(6)	50	(10)	37	(6)	65	(32)	71	(30)
Liver, gallbladder, biliary passages	(155, 156, 197.7, 197.8)	41	(6)	34	(6)	41	(6)	56	(25)	54	(29)
Pancreas	(157)	47	(13)	72	(24)	47	(13)	64	(56)	81	(59)
Lung, bronchus, trachea	(162)	23	(34)	19	(32)	23	(34)	58	(278)	78	(102)
Breast	(174)	-	-	-	-	-	-	-	-	92	(291)
Uterine cervix	(180)	-	-	-	-	-	-	-	-	76	(46)
Uterine corpus and unspecified	(182)	-	-	-	-	-	-	-	-	62	(31)
Ovary, uterine tube, broad ligament	(183)	-	-	-	-	-	-	-	-	70	(74)
Prostate	(185)	79	(35)	107	(66)	79	(35)	75	(87)	-	-
Bladder	(188)	73	(13)	22	(5)	73	(13)	70	(35)	66	(16)
Kidney	(189.0-189.1)	19	(2)	48	(6)	19	(2)	51	(18)	65	(14)
Nervous system	(191, 192)	65	(7)	65	(7)	65	(7)	67	(27)	84	(27)
All lymphomas	(200-202)	100	(18)	70	(14)	100	(18)	83	(51)	77	(42)
All leukemia	(204-207)	103	(19)	80	(18)	103	(19)	97	(56)	98	(50)
All other sites (not given above)		59	(35)	50	(33)	59	(35)	69	(128)	80	(139)
Smoking-related cancer sites <sup>c</sup>	(140-150, 162, 188)	26	(49)	20	(43)	26	(49)	58	(353)	80	(151)
Nonsmoking related cancer sites	(151-209, except 162 and 188)	67	(193)	69	(242)	67	(193)	70	(626)	81	(1029)
All cancer (malignant neoplasms)	(140-209)	50	(242)	50	(285)	50	(242)	65	(979)	81	(1180)

<sup>a</sup> International Classification of Diseases.

<sup>b</sup> Number of deaths upon which rate is based is given in parentheses.

<sup>c</sup> Defined here to be cancer sites of buccal cavity and pharynx, esophagus, lung, bronchus, trachea, and bladder.

dying before the age of 65. Also a 35-year-old California active Mormon male has a remaining life expectancy of 44.6 years, about 8 years greater than for U.S. white males (Enstrom 1978). A great deal of effort has gone into measuring and establishing the validity of these mortality rates, which are based largely on Mormon church records (Enstrom 1975, 1978, 1979 and in prep.). The overall S.E. in the age-specific rates is of the order of 5-10%. (Reference should be made to the earlier publications for specific details.)

Other findings of interest in Tables 1 and 2 are that for the smoking-related cancer sites, defined here as being the buccal cavity and pharynx, esophagus, lungs, bronchus, trachea, and bladder, the SMR ratio is 26%, which is about what one observed in typical nonsmokers. However, for the nonsmoking-related sites, arbitrarily defined as all other cancer sites, the SMRs are 67-70% for Mormon males and 81% for Mormon females. These ratios are statistically significantly less than 100%, whereas average nonsmokers have a ratio of about 100% (Enstrom 1978, 1979 and in prep.). The Mormon SMRs are unexpectedly low for colon, rectum, liver, pancreas, kidney, and uterus cancer. However, active Mormons appear to be similar to some specially selected cohorts of nonsmokers in overall cancer and total mortality rates. These special cohorts include California Seventh-day Adventists, and nonsmokers in the American Cancer Society cancer prevention study (Hammond 1966) and Dorn's study of U.S. veterans (Kahn 1966), but these cohorts all involved self-selected healthy questionnaire respondents who were above average in socioeconomic status. The Mormon mortality data are based on a cross-sectional survey and not on questionnaire respondents. The objective now is to try and understand the low Mormon mortality rates in terms of their life-style and other health-related characteristics.

## MATERIALS AND METHODS

The emphasis in this discussion is to present data comparing numerous characteristics of Mormons with those of the general population. The data available at this time is cross-sectional survey information gathered on small numbers of nonrandom samples of Mormons. The philosophy here is to compare several small groups of Mormons to look for consistencies and trends in the data. The results are not definitive but they do indicate patterns which are to be further refined. The various survey groups are outlined below and summarized in Table 3.

### 1979 California High Priest Survey

A four-page questionnaire requesting information about demographic characteristics, health habits, basic dietary practices, and other health-related characteristics was mailed to about 12,000 High Priests' households throughout California in November 1979. Two questionnaires were mailed to each household, one for

the High Priest and one for his wife. To date about 8000 questionnaires have been returned and the first 367 male and 314 female questionnaires have been processed and analyzed in a preliminary way. These questionnaires probably comprise a fairly representative sample of active California Mormons, who essentially all attend church every week.

### 1974 Alameda County, California Survey

A valuable source of data on Mormons and non-Mormons in one California county is the 1974 Human Population Laboratory survey of a representative sample of the noninstitutionalized adult population of Alameda County, California (Belloc 1976; Breslow and Enstrom 1980). This is a follow-up of an earlier 1965 survey (Hochstim 1970; Breslow and Enstrom 1980). A 28-page questionnaire with information on demographic and health characteristics and health habits was completed by 3119 persons (1409 males and 1710 females). Contained within the sample were 71 Mormons (32 males and 39 females), including 38 Mormons who attended church every week (18 males and 20 females). This latter group is defined as "active Mormons" for the purposes of comparison with High Priests and wives described above. The definitions are not identical but major similarities should be revealed. The total Alameda County sample, which is only 2% Mormon, permits a good comparison of Mormons and non-Mormons since the same survey instrument was administered to everyone in the same way as part of a general health survey and the question on religion was only incidental. The 1965 and 1974 Alameda County surveys have been used to establish seven good health practices that are strongly related to subsequent mortality (Breslow and Enstrom 1980).

### 1978 Pullman, Washington, Active Mormon Survey

In 1978 Norma C. McIntosh completed a dissertation at Washington State University on the nutritional and dietary characteristics of 56 active Mormon adult men in the Pullman, Washington, area (McIntosh 1978). These men were all active in the Mormon Church and probably included many High Priests. Obviously this is not an ideal comparison group for California active Mormons because it is a nonrandom sample of active Mormons located in another state, but it does provide the only currently available detailed information on the dietary and nutrient intake of active Mormons. I cannot confirm the accuracy or validity of this data, but again it should be good enough to provide a gross indication of the nutrition characteristics of one group of active Mormons until specific data becomes available on active California Mormons.

### 1976 Los Angeles, California, Mormons

This is a very small survey of 21 middle-aged men conducted by nutritionists at the UCLA School of Public Health quite independently of my research

**Table 3**  
**Basic Description of Several Samples of Mormons and the General Population**

	Location	Population		Sample size	Age (years)		Race (% white)	Reference	
		general name	specific definition		mean	range			
<b>Males</b>									
1968	Washington, D.C.	Seventh-day Adventists	lacto-ovo vegetarians	86	42	15-74	100	West and Hayes 1968	
					55	52	35-74		100
1974	Alameda County, California	active Mormons	Mormons in sample who attended church every week	18	41	25-78	89	Belloc 1976	
		all Mormons total sample	all Mormons in sample total county sample	32	44	25-78	94		
1976	Los Angeles, California	"Mormons" <sup>a</sup>	largely Mormon sample near UCLA	1409	44	20-98	79	Slater et al. 1976	
				21	51	41-66	~100		
1978	Pullman, Washington	active Mormons	active Church-attending Mormons	56	41	23-72	100	McIntosh 1978	
				34	50	35-72	100		
1979	California	active Mormons	sample of Mormon High Priests	367	55	25-90	99	National Center for Health Statistics 1979	
1971-74	United States	whites	HANES <sup>b</sup> national sample of whites	7004	35 <sup>c</sup>	1-74	100		
					4343	41 <sup>c</sup>	18-74		100
					3046	53 <sup>c</sup>	35-74		100
		"Mormons" <sup>a</sup>	HANES whites born in Utah (about 50% Mormons)	12	35 <sup>c</sup>	1-66	100		
				8	47 <sup>c</sup>	33-66	100		
<b>Females</b>									
1974	Alameda County, California	active Mormons	Mormons in sample who attended church every week	20	41	21-71	100	Belloc 1976	
		all Mormons total sample	all Mormons in sample total county sample	39	45	20-95	95		
				1710	45	18-95	78		
1979	California	active Mormons	sample of High Priest wives	314	51	26-85	99	National Center for Health Statistics 1979	
1971-74	United States	whites	HANES national sample of whites	9347	35 <sup>c</sup>	1-74	100		
					6758	42 <sup>c</sup>	18-74		100
					4054	53 <sup>c</sup>	35-74		100
		"Mormons" <sup>a</sup>	HANES whites born in Utah (about 50% Mormons)	22	35 <sup>c</sup>	1-68	100		
				19	43 <sup>c</sup>	22-68	100		

<sup>a</sup>Whites born in Utah.

<sup>b</sup>Health and Nutrition Examination Survey.

<sup>c</sup>Mean age based on age distribution of weighted sample, not unweighted survey sample (see text).

(Slater et al. 1976). Coincidentally, most of the men recruited for this study were Mormons from one ward near UCLA. The purpose of this study was to measure blood cholesterol in relation to egg consumption and is included here only to compare the mean blood cholesterol among this nonrandom sample of Mormons, the Pullman, Washington, active Mormon sample, and nonrandom 1968 sample of lacto-ovo-vegetarian Seventh-day Adventists from Washington, D.C. (West and Hayes 1968).

#### 1971-74 U.S. Health and Nutrition Examination Survey

The first Health and Nutrition Examination Survey (HANES I) was conducted from 1971 through 1974 (Miller 1973; Abraham and Carroll 1979; National Center for Health Statistics 1979). The survey measured the nutritional and health status for a scientifically designed sample representative of the civilian noninstitutionalized population of the U.S. Of the 28,043 sample persons selected to represent 194 million persons aged 1-74 years in the U.S. population, 20,749 persons (74%) were examined, including 7004 white males and 9347 white females. The survey involved general medical and dental examinations; a dietary interview consisting of a 24-hour recall of food consumption and a food frequency questionnaire; and laboratory tests of blood and urine. Estimates reported here are based on weighted observations to account properly for the sampling fractions and response rates in the survey. Survey details can be obtained elsewhere (National Center for Health Statistics 1979). Within the total white sample are 12 men and 22 women who were born in Utah, including 8 men and 19 women aged 18-74 years. These Utah-born whites did not reside in Utah in 1971-74 because Utah was not one of the HANES I sampling areas, but they have been designated as "Mormons," because about 70% of all persons born in Utah are Mormons and about 50% of all Utah-born persons residing outside of Utah are Mormons (Enstrom 1978). One indication that they are mainly Mormons is their large-scale avoidance of coffee and tea. This group is used in lieu of better data and only for gross comparisons.

#### RESULTS

The results of the various surveys of samples of Mormons and the general population are summarized in Tables 4-9. Reference should be made to Table 3 for a summary description of each sample. Table 4 is the most comprehensive data source and gives comparisons of major demographic and health-related characteristics, including race, age, marital status, educational level, occupational level, income level, residence history, height, weight, number of children, tobacco smoking status, consumption of alcohol, coffee, tea, milk, and juices, measures of physical activity, current health status, sleep, regularity of meals, health practice score, medical check-up status, and use of nonprescription drugs. This table compares California active Mormons with active Mormons, all

Mormons, and the general population in Alameda County, California. Alameda County is fairly similar to California and the U.S. in most respects (Hochstim 1970).

Table 5 focuses on a comparison of mean height and mean weight for Alameda County Mormons, Los Angeles "Mormons," Pullman, Washington, active Mormons, and California active Mormons. There is remarkably good agreement between these groups of Mormons and with the Alameda County and U.S. white samples. Basically Mormons appear to be average in both height and weight compared to other U.S. whites. However, all groups are about 10-15% above the weight for height recommended by the Food and Nutrition Board of the National Academy of Sciences.

Table 6 compares mean blood cholesterol levels on some small nonrandom samples and shows that Mormons and Seventh-day Adventists both have levels around 200 mg/100 ml, which is about 10-15% below the corresponding levels in U.S. whites.

Table 7 compares the selected mean daily nutrient intake of Pullman, Washington, active Mormons with U.S. "Mormons" (whites born in Utah) and total whites. The Mormon samples are small and not centered in California but are included here to give a gross comparison. Note the Mormons are quite similar to U.S. whites in total intake of calories, protein, fat, carbohydrate, and dietary cholesterol. They meet or exceed the recommended intake of major vitamins and minerals; their intake of vitamin C from food sources alone is two to three times the recommended dietary allowance.

Table 8 compares Mormon and U.S. white food frequency distributions for the following selected food groups: meat, fish, or poultry; eggs; fruits and vegetables; desserts; whole milk; and coffee and tea. This table is meant only to give gross indications of food usage, and not an accurate quantitative measure because of the nature of the questions asked. There are no clear differences between Mormons and U.S. whites in use of eggs, fruits, vegetables, desserts, and whole milk. Although essentially all Mormons currently use meat, fish, or poultry, they appear to use it primarily less than seven or more times per week; the exact quantity consumed cannot be determined from these questions. Only with regard to coffee and tea usage do Mormons clearly consume much less than the general population.

Table 9 summarizes the use of vitamin supplements and specifically vitamin C supplements. Mormons in Alameda County and California clearly consume a large amount of supplements; about two-thirds of them use supplements regularly or irregularly, compared with about one-third in U.S. whites. Alameda County as a whole exceeds U.S. consumption.

#### DISCUSSION

Given the variety of data sources and the potential for systematic and random error it is impossible to draw definitive conclusions about the relationship

Table 4  
Comparison of Major Demographic and Health-related Characteristics of Samples of Mormons and the General Population

Questionnaire characteristic	Males <sup>a</sup>				Females <sup>a</sup>			
	1979 California		1974 Alameda County, California		1979 California		1974 Alameda County, California	
	active Mormons	all Mormons	active Mormons	all Mormons	active Mormons	all Mormons	active Mormons	all Mormons
Sample size	367	1409	18	32	314	39	20	1710
Race (% white)	99%	79%	89%	94%	99%	97%	95%	97%
Age								
(Mean in years)	55	44	41	44	51	45	44	45
(Range in years)	25-90	20-98	25-78	25-78	26-85	20-95	21-71	18-95
Marital status								
(% Married)	97%	74%	78%	84%	99%	77%	85%	77%
(% Never married)	1%	17%	22%	16%	0%	5%	10%	5%
(% Widowed)	1%	2%	0%	0%	1%	13%	5%	13%
(% Divorced)	1%	5%	0%	0%	0%	5%	0%	5%
Educational level								
(Mean in years)	14.0	12.8	13.8	13.4	14.0	12.0	12.7	12.4
(% With 16+ years)	50%	26%	44%	31%	22%	13%	20%	19%
(% With <12 years)	12%	24%	28%	19%	8%	33%	15%	26%
Occupational level (% professional, technical, or managerial)	62%	37%	61%	56%	10%	13%	15%	24%
Family income level								
(% With 10,000+ income)		64%	61%	75%		56%	70%	52%
Community size of longest residence (% In 100,000+ cities)	33%	55%	33%	31%	40%	46%	40%	57%
Height (mean in inches, without shoes) (see Table 5)	70.3	69.9	70.2	69.8	64.3	64.0	64.7	64.1
Weight (mean in pounds, without clothes) (see Table 5)	180	172	175	174	144	134	135	137
Number of natural children (mean)	4.1	1.7	1.8	1.9	3.9	2.4	2.8	1.9
Cigarette smoking status								
(% Current)	1%	38%	6%	22%	1%	18%	0%	33%
(% Former)	30%	27%	44%	37%	11%	18%	20%	16%
(% Never)	68%	35%	50%	41%	88%	64%	80%	50%
Cigar smoking (% current)	0%	8%	0%	9%	0%	0%	0%	1%
Pipe smoking (% current)	1%	11%	0%	3%	0%	0%	0%	0%
Beer drinking (% current)	1%	74%	6%	31%	1%	26%	0%	40%
Wine drinking (% current)	0%	72%	0%	25%	1%	31%	5%	63%
Liquor drinking (% current)	1%	74%	0%	31%	1%	31%	5%	62%
Coffee drinking (% current)	3%	78%	6%	38%	3%	46%	15%	75%
Tea drinking (% current)	2%	22%	6%	6%	1%	21%	10%	39%
Milk drinking								
(% Current)	89%	66%	89%	84%		72%	75%	58%
(Mean number glasses per day)	1.7	1.2	1.7	1.5	1.4	1.7	1.4	1.0
Orange, tomato, or grapefruit juice								
(% Current)	78%	56%	78%	66%	70%	62%	70%	65%
(Mean number small glasses per day)	1.1	0.8	1.1	1.1	0.9	0.8	0.9	0.9
How often do you eat at least 2 servings of fruit or vegetables in a day? (% almost every day)								
(% Often)	83%	62%	83%	78%	95%	85%	95%	73%
How often do you do active sports?								
(% Sometimes)	18%	18%	11%	9%	6%	5%	5%	8%
(% Never)	35%	46%	50%	44%	21%	41%	45%	38%
	27%	34%	39%	47%	47%	51%	50%	49%

Table 4 - Continued.

Questionnaire characteristic	Males <sup>a</sup>				Females <sup>a</sup>			
	1974 Alameda County, California		1974 Alameda County, California		1974 Alameda County, California		1974 Alameda County, California	
	1979 California active Mormons	active Mormons	all Mormons	total sample	1979 California active Mormons	active Mormons	all Mormons	total sample
How often do you do physical exercises?								
(% Often)	28%	22%	19%	22%	22%	18%	19%	19%
(% Sometimes)	43%	39%	50%	46%	48%	49%	48%	48%
(% Never)	17%	39%	31%	30%	17%	25%	30%	30%
Current health status								
(% Excellent)	48%	56%	40%	35%	42%	30%	28%	29%
(% Good)	44%	33%	44%	52%	48%	55%	46%	51%
(% Fair)	6%	6%	13%	10%	7%	15%	21%	17%
(% Poor)	1%	6%	3%	3%	1%	0%	5%	3%
Usual hours of sleep								
(% With 7 or 8 hours)	78%	78%	78%	75%	83%	85%	90%	73%
Eating breakfast								
(% Almost every day)	79%	72%	66%	57%	77%	70%	67%	59%
Eating between meals								
(% Once in a while, rarely or never)	69%	83%	84%	73%	60%	50%	59%	65%
Health practice score <sup>b</sup>								
(Mean on 0 to 7 scale)		5.2	5.1	4.8		5.5	5.4	4.9
(% With 6 or 7 practices)		39%	38%	33%		55%	54%	35%
General medical check-up								
(% Within the last year)	48%	56%	56%	38%	54%	60%	59%	50%
(% Never)	7%	17%	16%	20%	3%	20%	15%	15%
For those receiving general medical check-up, did it include:								
Breast exam (% yes)					100%	94%	88%	86%
Pap smear (% yes)					100%	94%	88%	78%
Use of nonprescription drugs								
Laxatives (% never)	72%	72%	75%	71%	63%	60%	59%	56%
Tranquilizers (% never)	84%	89%	91%	84%	83%	75%	74%	70%
Sleeping pills (% never)	84%	94%	94%	89%	87%	85%	82%	82%

<sup>a</sup> Refer to Table 3 and text for complete definition of population.

<sup>b</sup> Refer to Breslow and Enstrom (1980) for definition.



Table 5  
Mean Height, Weight, and Age for Samples of Mormons and for the General Population

Year	Location	Population <sup>a</sup>	Males			Females		
			mean age (years)	mean height <sup>b</sup> (inches)	mean weight <sup>c</sup> (pounds)	mean age (years)	mean height <sup>b</sup> (inches)	mean weight <sup>c</sup> (pounds)
1974	Alameda County, California	active Mormons	41	70.2	175	41	64.7	135
		all Mormons	44	69.8	174	45	64.0	134
		total sample	44	69.9	172	45	64.1	137
1976	Los Angeles, California	"Mormons" <sup>d</sup>	51	71.1	190			
1978	Pullman, Washington	active Mormons	41	70.3	177	51	64.3	144
1979	California	active Mormons	55	69.0	180	{ 43	63.6	142
1971-74	United States	whites	{ 53	68.6	174	{ 53	63.3	146
		"Mormons" <sup>d</sup>	47	69.1	179	43	63.6	144
1974	FNB-NAS recommended weight for height			69	154		65	128

<sup>a</sup> Refer to Table 3 and text for complete definition of population.

<sup>b</sup> Height without shoes.

<sup>c</sup> Weight without clothes.

<sup>d</sup> Whites born in Utah.

Table 6  
Mean Blood Cholesterol Levels (mg/100 ml) in Male Samples of Mormons, Seventh-day Adventists, and U.S. Whites

Year	Location	Population <sup>a</sup>	Sample size	Age (years)		Blood cholesterol (mg/100 ml)	
				mean	range	mean	standard deviation
Ages 35-74 years							
1968	Washington, D.C.	Seventh-day Adventists	55	52	35-74	196	~ 40
1976	Los Angeles, California	"Mormons" <sup>b</sup>	21	51	41-66	198	30
1978	Pullman, Washington	active Mormons	34	50	35-72	205	~ 32
1971-74	United States	HANES <sup>c</sup> white sample	3046	53	35-74	237	50
Ages 15-74 years							
1968	Washington, D.C.	Seventh-day Adventists	86	42	15-74	187	~ 40
1978	Pullman, Washington	active Mormons	56	41	23-72	203	32
1971-74	United States	HANES white sample	4343	41	18-74	222	50
							1.1

<sup>a</sup> Refer to Table 3 and text for complete definition of population.

<sup>b</sup> Whites born in Utah.

<sup>c</sup> Health and Nutrition Examination Survey.

**Table 7**  
Selected Mean Daily Nutrient Intake for Samples of Mormons, Compared with U.S. Whites (Aged 18-74 Years) and U.S. Recommended Dietary Allowances

Nutrient	Males <sup>a</sup>			Females <sup>a</sup>		
	1978 Pullman, Washington active Mormons	1971-74 U.S. whites (18-74 years)	1974 U.S. RDA <sup>c</sup> (males, 23+ years)	1971-74 U.S. whites (18-74 years)	1974 U.S. RDA (females, 23+ years)	
		"Mormons" <sup>b</sup> total		"Mormons" <sup>b</sup> total		
Sample size	56	8	4343	19	6758	
Calories (kcal)	2574	3227	2492	1863	1553	1900
Protein (g)	16%	97	99	80	63	
(% kcal)		~14%	~18%	~20%	~18%	~12%
Fat (g)	39%	157	104	79	63	
(% kcal)		~44%	~38%	~40%	~38%	~42%
Carbohydrate (g)	46%	362	262	186	176	
(% kcal)		~42%	~44%	~40%	~44%	~46%
Vitamin A (IU) <sup>d</sup>	8223	2825	5386	5774	4750	4000
Vitamin B <sub>1</sub> -Thiamine (mg) <sup>e</sup>	1.8	3.3	1.5	1.1	1.0	1.0
Vitamin B <sub>2</sub> -Riboflavin (mg) <sup>e</sup>	2.8	2.0	2.3	2.1	1.5	1.2
Niacin-Nicotonic Acid (mg) <sup>e</sup>	24	26	23	18	14	13
Vitamin C-Ascorbic Acid (mg) <sup>e</sup>	135	92	92	96	85	45
Calcium (mg)	1298	826	962	1027	640	800
Iron (mg)	~460	19	15	10	10	10
Cholesterol (mg)			~480			

<sup>a</sup> Refer to Table 3 and text for complete definition of population.

<sup>b</sup> Whites born in Utah.

<sup>c</sup> U.S. Recommended Dietary Allowance.

<sup>d</sup> International Units.

<sup>e</sup> Vitamin intake based on food intake only, not including vitamin supplements.

**Table 8**

Selected Food Frequency Distributions for Samples of Mormons and U.S. Whites (Ages 18-74 Years): Percentage of Persons Who Use Selected Food Groups "Never or Formerly" or "7+ Times/Week"

Food group	Males <sup>a</sup>			Females <sup>a</sup>		
	1979 California active Mormons	1971-74 U.S. whites (18-74 years)	1974 U.S. RDA <sup>c</sup> (males, 23+ years)	1979 California active Mormons	1971-74 U.S. whites (18-74 years)	1974 U.S. RDA (females, 23+ years)
	Frequency	"Mormons" <sup>b</sup> total		"Mormons" <sup>b</sup> total		
Sample size	367	8	4343	314	19	6758
Meat, fish or poultry	% never or formerly	2	0	0	0	0
	% 7+ times/week	34	24	86	35	83
Eggs	% never or formerly	2	3	4	2	13
	% 7+ times/week	8	0	19	7	12
Fruits and vegetables	% never or formerly	<sup>c</sup>	0	0	<sup>c</sup>	0
	% 7+ times/week		84	90		88
Desserts	% never or formerly	5	0	5	7	12
	% 7+ times/week	20	6	35	17	40
Whole milk	% never or formerly	14	3	14	24	20
	% 7+ times/week	46	53	53	43	51
Coffee and tea	% never or formerly	94	57	6	92	48
	% 7+ times/week	2	43	82	3	45

Percentages in this table are meant to give gross indication of food usage, but not an accurate quantitative measure.

<sup>a</sup> Refer to Table 3 and text for complete definition of population.

<sup>b</sup> Whites born in Utah.

<sup>c</sup> No comparable information available.

Table 9  
Vitamin Supplement Usage (% Distribution) among Samples of Mormons and the General Population

Population <sup>a</sup>	Male usage distribution (%)					Female usage distribution (%)					
	never or formerly	currently			unknown	never or formerly	currently			unknown	
		total	regularly	occasionally			total	regularly	occasionally		
	Total vitamin supplement usage					Total vitamin supplement usage					
1974 Alameda County, California											
Active Mormons	33	67	33	33	0	35	65	45	20	0	
All Mormons	31	69	34	34	0	36	64	41	23	0	
Total sample	48	52	29	23	0	39	61	36	25	0	
1979 California active Mormons	37	60			3	31	67			3	
1971-74 United States whites (ages 18-74)											
" Mormons" <sup>b</sup>	57	43	29	14	0	43	57	35	22	0	
Total sample	72	29	19	10	0	61	39	27	12	0	
	Vitamin C supplement usage					Vitamin C supplement usage					
1974 Alameda County, California											
Active Mormons	46	56			0	50	50			0	
All Mormons	42	60			0	46	54			0	
Total sample	54	45			1	46	52			2	
1979 California active Mormons	45	47			9	38	49			13	

<sup>a</sup> Refer to Table 3 and text for complete definition of population.

<sup>b</sup> Whites born in Utah.

between the Mormon life-style and their subsequent mortality from cancer and other causes. But based on previous work, it has been firmly established that active California Mormons are an unusually low-risk population and this low risk can only be partially explained by the fact that they are nonsmokers. The rest of the explanation will emerge from other differences that exist between Mormons and the general population.

Based on the data presented in Tables 3-9 it is possible to divide major life-style characteristics into three categories: those where active Mormons have large differences from the general population, those where relatively small but fairly consistent differences exist, and those where no difference is evident. The following large, clear differences exist: active Mormons use essentially no cigarettes, cigars, pipes, beer, wine, liquor, coffee, or tea, indicating adherence to the Word of Wisdom. The following relatively small but fairly consistent differences exist: active Mormons have a somewhat higher educational level, are mostly all married, have a larger number of children. Mormon men tend to have a higher occupational level, but most of the women are housewives or homemakers. Active Mormons drink more milk and use more fruits, vegetables, and vitamin and mineral supplements; have somewhat better health practices and current health status; have somewhat more frequent general medical check-ups; and have somewhat lower mean blood cholesterol and somewhat less frequent use of meat, fish, or poultry. Active Mormons do not differ significantly from the general population in the following areas: height, weight, participation in active sports or physical exercises, use of nonprescription drugs, total intake of calories and fat, intake of vitamins and minerals from foods, and intake of dietary cholesterol.

Some aspects of Mormons have not yet been analyzed such as heredity and psychosocial factors. Of course, it is going to be hard to distinguish hereditary factors when the Mormon life-style has probably been similar for generations. Also, some of the findings summarized above, especially in the dietary area, could change when more complete information is available on active California Mormons. At that time it will be possible to subdivide active Mormons according to specific health-related characteristics and determine an optimally healthy group. In the meantime the data presented in this paper can be used for general descriptive purposes, provided its limitations are kept in mind. Mormons are an unusually healthy group of Americans from which it should be possible to learn valuable new information about the prevention of cancer and other major diseases.

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