

Mormon Health

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Prove thy servants, I beseech thee, ten days; and let them give us pulse to eat, and water to drink.

Then let our countenances be looked upon before thee, and the countenances of the children that eat, of the portion of the king's meat; and as thou seest, deal with thy servants.

So he consented to them in this matter, and proved them ten days.

And at the end of ten days their countenances appeared fairer and fatter in flesh than all the children which did eat the portion of the king's meat.

Daniel 1:12-15

THE EXPERIENCE OF DANIEL and his friends in Nebuchadnezzar's Babylon was, perhaps, the first published instance of a controlled clinical trial. This preliminary success led to an extension of the trial diet for a three-year period, at the end of which Daniel's group not only demonstrated fairer countenances, but superior performances on the king's equivalent to an I.Q. test.

Although perceptive observers were to comment on the relationship of disease to various occupations or diets regularly from the time of the early Greek physicians onward, rigorous "scientific" verification of such observations is a recent development. Sir Percival Potts had deduced a link between soot and scrotal cancer in chimney sweeps on the basis of primitive

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epidemiological principles late in the eighteenth century, but the heyday of the study of the incidence of disease in various populations (i.e., epidemiology) still awaited the development of more sophisticated bio-statistical techniques in the mid to late nineteenth century. Anecdotal indications of the benefits of various programs— or diets— remained the most popular preaching tool of their advocates, be they physicians or ministers, throughout the 1800s.

In order to conclusively document better health in any group, it was necessary to compile accurate health statistics. The development in the early 1900s of federal and state public health agencies led to the tabulation of health statistics on a large scale for the first time in the United States. Utah began certifying all deaths in 1905, and is considered to have complete coverage since 1910. (The Church started to announce such statistics as annual birth and death rates about the same time, but the figures were not reliable for several decades.)

Beginning in the 1930s and continuing into the 1950s, research efforts finally established a strong epidemiological link between cigarette smoking and lung cancer. Intensive research on the causes of cancer during this period elucidated the role of other carcinogens, or cancer-causing substances, especially in industrial settings. It came to be accepted that personal habits as well as environment played at least some role in the causation of certain malignancies. During this same period, links between cigarette smoking and cardiovascular disease were first suspected. In a long-range, large scale investigation of heart disease in Framingham, Massachusetts, diet and personal habits (including smoking) were shown to be contributing factors in heart disease.

The role of the environment as a causal agent in non-infectious disease is now one of the major areas of medical research. Since prevention is much superior to attempting a cure, much effort is now expended identifying specific groups most at risk for various diseases. In the process, it has become evident that environmental factors operate in a multicausal framework. Both the general environment and personal health practices (such as the Word of Wisdom) must interact with hereditary sensitivity or "immuneness" to a disease. Individual cases may be—and often are—exceptions to the general rule, and thus health influences must be demonstrated in a *group* effect.

In the 1960s, researchers studying cancer and heart disease noted that there were differences in the incidences of these diseases in people of different religious affiliation. Jewish people, for example, had low risk for cervical cancer, and Seventh-Day Adventists had low risk for cancer of the lung, colon, and other sites. California Adventists over the age of thirty were shown to have a lower overall mortality than their non-Adventist neighbors.

In the 1970s research has been directed at another religious group prominent among those that exert control over the diet and behavior of their adherents—the Mormons. While similar in many ways to that of Adventists, the Mormon lifestyle, shaped by the dietary guidelines of the Word of Wisdom as well as other social and moral doctrines, is sufficiently different from

that of most non-Mormons to suggest that Mormon health might be significantly different as well.

EARLY MORMON HEALTH

Widespread adherence to the Word of Wisdom—the apparent source of much of the Mormon health difference—did not begin until well after the Saints migrated to Utah. Beginning in the latter part of the last century, the revelatory proscription against alcohol, tobacco, coffee and tea started to be enforced as a requirement for full participation in the Church.¹ Prior to that time, the most notable peculiarity of Mormonism was the doctrine of polygamy, which practice was felt by some medical observers to have a very deleterious effect on polygamists as well as their offspring. Many medical journals carried reports of the sickly status of the Mormons in the first decades of their western migration. Unreliable census reports appeared to confirm the impressions of a number of firsthand observers that there was an unusually high mortality among the Mormons, especially among infants and children. As primitive frontier conditions improved and more objective observers submitted their reports, this notion gradually disappeared. By the close of the nineteenth century, the health of the Saints was not so often questioned. If anything, they were credited, in the popular mind, with unusual sexual stamina.²

The Church first began to report “Mormon” death rates early in the twentieth century, and to the surprise of some, the Saints appeared to do considerably *better* than the nation at large. Attention was called to this fact in various General Conferences and in works such as Frederick J. Pack’s *Tobacco and Human Efficiency* (published by the Church in 1918). By and large, however, the unreliability of the statistics make such early claims little more trustworthy than the anecdotal evidence of the previous century.

In 1937, John and Leah Widtsoe published *The Word of Wisdom: A Modern Interpretation*, in which the revelation was viewed in the light of then-current scientific findings. In remarking on the health of the Mormons, the Widtsoes cited gross death rates by cause, as determined by Church records, and compared them to overall U.S. rates and rates for six industrialized nations from a 1929 League of Nations report. Though fraught with methodological problems, this report supported the claim that Mormons enjoyed better health than the comparison groups. The Widtsoe’s statistics suggested that Mormons had about half the cancer rate of the comparison nations, as well as less heart, kidney and lung disease. There were also said to be fewer deaths from diseases of the nervous and digestive systems, and only a very small fraction (e.g., 10%) as many deaths from complications of pregnancy, diabetes and tuberculosis. Of all the conditions compared, only in the case of typhoid did the Mormons fare no better than their contemporaries. (Other data, not cited, might have shown them to compare less favorably in the case of rheumatic fever and smallpox.)

The Word of Wisdom itself had gone so far as to include very specific, if symbolic, promises as a reward for compliance: “They [adherents] shall re-

ceive health to their navel and marrow to their bones . . . and shall run and not be weary and walk and not faint." While no one, to our knowledge, has yet done comparative bone marrow studies, or found active Mormons phenomenally strong in marathons or endurance walks, the underlying question of Mormon health, at least until very recently, also has not been evaluated with the sophisticated tools of modern epidemiology. Are Mormons really any healthier than non-Mormons?

CANCER

In 1975, James Enstrom published an article in *Cancer* on mortality from various malignancies among California Mormons. This fairly large study pointed out that Mormons seemed to have one-half to three-fourths the cancer incidence of the general California population. The study was a good preliminary indication of Mormon cancer rates, but lacked accurate data in several areas for the specific study group.³

At the same time, we were preparing several studies on both cancer and heart disease among Utah Mormons. Mormons and Utahns lend themselves admirably to such health studies. With over 37% of the U.S. Mormon population, Utah contains the largest single group of Mormons in the U.S. (777,633 in 1970). The now improved record system of the Mormon Church, which was computerized in the mid 1970s, aids in helping to determine whether or not a Utahn is LDS. (Church genealogical data also have promise as an aid to genetics researchers who have established several research projects in Salt Lake City.) In 1966, the Utah Cancer Registry was established, which identifies and follows all cancer cases, except skin cancers, in the state. These and other factors make the state a good area for disease research and an ideal area for Mormon, non-Mormon studies.

In early 1976, we published, in the *New England Journal of Medicine*, a study on cancer incidence in Mormons and non-Mormons in Utah.⁴ By taking all incidences of reportable cancer in the state from 1966 to 1970, and carefully comparing with Church and public records, we were able to separate the nearly 11,000 cases by religion—Mormon and non-Mormon. Because of the availability of good demographic data, we were able to correct our data for age distribution and other potentially confounding factors. (For example, most forms of cancer are diseases of middle and late age. Mormons, with their high birth rate, have a younger age distribution, which must be corrected for.) The data are presented as age-standardized (any difference in age in the population has been controlled for, mathematically) incidence ratios (SIRs). The reference population is a sample of U.S. population, and expected numbers of new cancer cases in Mormons and non-Mormons are obtained by applying the U.S. rates to the Mormon and non-Mormon populations. This expected value is divided into the observed number of cases and multiplied by 100. A ratio of 100 means no difference from the U.S. average. Less than 100 means the disease was less common than in the general U.S. population. The results of our study are shown in Table 1.

Our results pose some intriguing questions. Cancer sites listed as "smoking related" (i.e., gum and mouth, tongue, pharynx, larynx, lung, esophagus

Table 1. *Selected Mormon and non-Mormon standardized incidence ratios (SIRs) compared to Third National Cancer Survey and comparison of Mormon to non-Mormon ratios within Utah.*

Site	Sex	Utah SIR × 100		Statistical comparison of LDS to non-LDS
		LDS	non-LDS	
All sites (excluding skin)	M	72.7	106.3	+
	F	75.8	115.3	+
Smoking associated sites	M	44.2	94.0	+
	F	43.2	95.9	+
Lip	M	292.6	359.4	+
	F	325.9	535.6	+
Esophagus	M	37.6	113.5	+
	F	17.9	82.2	+
Stomach	M	66.8	109.9	+
	F			
Colon	M	62.1	90.5	+
	F	62.3	106.8	+
Pancreas	M	68.8	83.9	+
	F	56.9	106.5	+
Larynx	M	39.3	142.0	+
	F	37.8	142.2	+
Lung	M	37.8	84.3	+
	F	33.0	73.9	+
Breast	F	81.8	116.9	+
Cervix uteri (invasive)	F	55.4	126.8	+
Cervix uteri (in situ)	F	44.6	115.9	+
Corpus uteri	F	101.2	126.8	+
Ovary	F	73.5	105.0	+
Prostate	M	109.0	126.8	+
Bladder	M	66.3	106.9	+
	F	71.8	117.0	+

+Significant difference at $p < 0.01$

and bladder) show standard incidence ratios of 43.2 to 44.2 for the Mormon population and 94 to 95.9 for non-Mormon Utahns. The cancer site most closely associated with alcohol consumption, independent of cigarette consumption, is the esophagus, and Mormon men had an SIR of 37.6, as compared to 113.5 for non-Mormon. Overall, these results agree with the large body of evidence already implicating cigarettes and alcohol as carcinogens for several cancer sites.

This assessment included all persons who had any evidence of being a Mormon (including such a statement in an obituary, even if a Church record could not be found). We now know, from several large studies we've done, using random samples of the adult population of Utah, that the use, by Mormons and non-Mormons, of the substances proscribed by the Word of Wisdom is as follows:⁵

<u>Current cigarette smoker</u>	<u>LDS</u>	<u>non-LDS</u>
Male	10.9%	38%
Female	7.2%	39.7%
<u>Current user of alcohol</u>		
Male	16%	64%
Female	17%	60%

Such levels of consumption are compatible with the difference in rates observed between the two groups for those cancers known to be associated with tobacco and alcohol.

Thus, consumption of these substances may account for the differences noted for such sites, except possibly for cancer of the urinary bladder, in which Mormons fare better than other non-smokers. Although not yet demonstrated, it is possible that lower coffee drinking among the Mormons—as in the case of alcohol with cancer of the esophagus—may explain the remainder of the difference in this “tobacco-associated” cancer.

Rates of cancer of the female organs in Utah LDS women were strikingly lower than in other Utah women. In a yet-to-be-published study,⁶ we found markedly lower cervical cancer rates in Mormon (as compared to non-Mormon) women, despite findings by previous researchers that implicated high fertility patterns with increased cervical cancer rates (Mormon birth rates are consistently 50–60% above U.S. rates). But, preliminary findings in current research into links between a particular sexually-transmitted infection (herpes simplex virus 2) and cervical cancer, show that cancer risk increases with the number of sexual contacts a woman has, presumably because of increased possibility of exposure to an asymptomatic male carrier. The results of the cervical cancer study show Mormon women to have about half the promiscuity rates of non-Mormons, and that non-Mormon women with cervical cancer are much more likely to report multiple sexual contacts than age-matched, disease-free women. This seems to make a case for the law of chastity, especially applied to both sexes, possibly since chaste males are less likely to be carriers of herpes 2 virus.

Though it is widely believed that breast-feeding is linked with a decreased risk of breast cancer, there is no conclusive evidence supporting this. Whatever benefits derive from breast-feeding (and the authors believe they are substantial), the practice has no proven effect on breast cancer risk. Rather, the age at first full-term pregnancy (the earlier the age, the lower the risk) is one of the strongest determinants of life long breast cancer risk. The tendency for earlier marriage, and thus, first pregnancy, among Mormons explains about half of the low incidence of breast cancer seen in Mormon women.⁷ In almost all other populations, a low risk of breast cancer is associated with a high risk of cervical cancer. This, as Table 1 makes clear, is not the case in the LDS women. Again, this will force a rethinking of present hypotheses on the relationship between the two cancers.

Finally, though recent studies seemingly have implicated dietary fat and meat as factors in the origin of colonic and rectal cancers, incidence of these

Table 2. Average annual age-adjusted mortality ratios for major cancer sites among California Seventh-Day Adventists (SDAs) 1958–65, Utah Mormons (LDS) 1968–72, and the General U.S. white population (USA) 1965, age 35 and over, by sex.

Site	Sex	Mortality Ratios	
		SDA/USA	LDS/USA
All sites (excluding skin)	M	50	61
	F	66	57
Smoking associated sites	M	7	45
	F	9	32
Lip	M	—	—
	F	—	—
Esophagus	M	28	40
	F	22	22
Stomach	M	80	62
	F	84	47
Colon	M	57	57
	F	61	49
Pancreas	M	20	74
	F	60	59
Larynx	M	—	17
	F	—	114
Lung	M	4	46
	F	6	51
Breast	F	71	56
Cervix uteri (invasive & in situ)	F	61	34
Corpus uteri	F	22	65
Ovary	F	—	—
Prostate	M	77	86
Bladder	M	20	63
	F	37	41

cancers in Utah Mormons is below that even of the California Seventh-Day Adventists, who claim a 50% compliance with a vegetarian diet.

An interesting comparison of Mormon/Seventh-Day Adventist standardized mortality ratios (SMRs—measuring *deaths* only, rather than total incidence as in SIRs mortality rates) for previous cancer sites comprises Table 2. (In interpreting these results, it is well to remember the Adventists drop all smokers and drinkers from membership.)

While the Adventist data were gathered about ten years before the LDS data, the only cancer with a large enough change in overall national incidence over this time to show much difference would be stomach cancer. Since the Adventists are much stricter in eliminating “backsliders” than Mormons are, their incidence of tobacco-associated cancers is much lower than LDS. However, the similar or lower rates for cancers of the gastrointestinal tract in Mormons simply do not support the hypothesis implicating animal fats as a factor in colon cancer.

There are other cancer sites for which no explanation of Mormon rates is readily obvious: Low rates of stomach cancer for Mormon males (though

smoking may be associated), and high risk of lip cancer, for example, for the same group. Low rates of liver and kidney cancers for all Utah males likewise escape explanation.

It should be noted that the genetic contribution to cancer is not considered large. Breast cancer, likely, has the strongest tendency to cluster in families. Again, what the effect of genetics is in Mormons' favorable health status is not known. The idea that Mormons are more inbred than other populations has been put forward with little data. If this is true, one would expect an increase in the genetic component of cancer, and thus an increase in the LDS incidence, which is not the case.⁸

Table 3. *Standard mortality ratios for cardiovascular and other diseases Utah 1969-71*

	Sex	LDS	non-LDS	Statistical Significance
<i>Cardiovascular</i>				
Rheumatic	M	154.5	163.9	p < .01
	F	151.3	228.4	p < .01
Hypertensive	M	57.1	118.6	p < .01
	F	73.2	104.3	p < .05
Heart attack	M	63.8	88.9	p < .01
	F	64.8	101.3	p < .01
<i>Cerebrovascular</i>				
	M	78.9	88.1	NS
	F	98.5	77.3	NS
<i>Cirrhosis of the liver</i>				
	M	79.0	95.0	p < .01
	F	65.0	149.0	p < .01

CARDIOVASCULAR AND OTHER DISEASES

In 1978, we also published a study on cardiovascular disease in Utah.⁹ Using the same methods for identifying Church members as used in the cancer study, we found Utah Mormons to have 35% less mortality from ischemic heart disease than expected from U.S. rates while non-Mormons did not differ significantly from the U.S. norms. Mormon men also had a lower mortality from hypertensive heart disease (SMR of 57, compared to non-Mormon 119) and Mormon women, a lower mortality from rheumatic heart disease (SMR of 151, compared to non-Mormon 228, though the number of cases is too small to achieve statistical significance). This report substantiated previous reports of links between smoking and heart disease, but lower rates of tobacco consumption in Mormons only explain about half the differences noted, when compared to national non-smoker data. Though theories ranging from hardness of water to church attendance have been suggested in other studies, there is likely some other factor in Utah Mormons, beyond abstinence from tobacco, that operates to reduce deaths from heart attacks.

We also studied strokes (cerebrovascular disease) using the same methods as those used in the cardiovascular disease study. The results demonstrated lower than expected mortality for both LDS and non-LDS groups, with non-

LDS lower (but not statistically so) than LDS. These findings are consistent, to some extent, with our present knowledge of strokes, for which no tobacco effect has been demonstrated. Why Mormons should do well in the case of hypertensive heart disease, but not in the case of strokes which are also associated with hypertension, is not clear. Other factors affecting atherosclerosis are associated with strokes, but they are not well defined.

We also reviewed deaths from cirrhosis of the liver, because of its relationship to alcohol. Our studies in progress show Mormon males to have lower mortality rates from cirrhosis of the liver than non-Mormons (SMRs of 79, compared to 95), but, more surprisingly, Mormon women showed a much lower rate than the elevated mortality rate from cirrhosis shown by non-Mormon Utah women (SMRs of 65, compared to 149).¹⁰ What other diseases may be low in Mormons (or high for that matter)? Elder Widtsoe's publications on the Word of Wisdom list a number of other diseases, many of which presently contribute little to the total mortality of a population (tuberculosis, kidney disease, maternal mortality, and other infectious diseases). We presently have no data as to the comparative incidence or mortality of these conditions in the LDS, and little reason to suppose a religious difference. However, as noted, several of the cancer sites with large differences by religion do not follow from the Word of Wisdom (colon, cervix, breast, etc.) and investigations of these diseases may also yield additional surprises.

Some persistent myths also need to be laid to rest. One myth is that while Mormons don't smoke or drink, they are habituated to sugar and make up for their lack of other vices with ice cream, pastries, etc. Little hard data exist as to relative heights and weights in LDS compared to non-LDS, but the low mortality from heart attacks among LDS is strong evidence against it. Another myth is of high incidence of diabetes. Mortality rates for this disease are not a good measure of occurrence. Again, our surveys of the Utah population show no difference in reported diabetes between LDS and non-LDS. An additional area of research with many more methodological problems might center on reported mental health problems in LDS and non-LDS. One might use mental hospital admissions as an indicator, or possibly suicide rates.

NET MORTALITY RATES AND LONGEVITY

What should be evident is that with less cancer and heart disease, Mormons should be living longer. This is substantiated in the study done by Edward Robinson on longevity patterns among Mormons and non-Mormons in the West and the U.S. in general.¹¹ Table 4 shows that for Mormon males, expectation of life at birth averages over five years more than non-Mormon males, and for Mormon women, over three years more.

In a recent study of seventies and high priests (assuming higher activity and Word of Wisdom compliance), James Enstrom found the active Mormon male to be healthier than Mormons as a whole, and to rank among the lowest in mortality when compared to other groups of healthy U.S. males.¹² While there are yet many questions about the study (such as, do Mormons select healthy individuals in priesthood advancements?), it is at least a preliminary

Table 4. *LDS and non-LDS Expectation of Life at Birth from Life Table Analysis, Utah (1975) and USA (1970) after Robertson.*

	Utah		USA	
	LDS	non-LDS	LDS	non-LDS
Male	72.2	66.4	73.2	67.9
Female	77.7	74.3	78.9	75.6

indication that higher compliance to Mormon standards increases health benefits.

REMAINING QUESTIONS

The original impetus of our studies was the Mormon proscription of tobacco and alcohol and the lower incidence among Mormons of diseases related to their consumption, correlations which agree with popular scientific opinion. Yet, our studies have shown Mormons also to fare well in a number of diseases not known to be related to tobacco or alcohol. While our personal views of disease etiology lie somewhere on the continuum which runs from tobacco company researchers (who tout the cigarette as a harmless pleasure) to the naturopaths (who implicate most human afflictions, from dandruff to impotence, with poor diet), our research poses some valid and unanswered questions in regard to diet and disease. Is it possible that the lower rate of stomach cancer in Mormons is related to lower coffee consumption, or that some combination of abstinence, home canning, emphasis on whole wheat products, and other dietary considerations explains the lower rates of bowel cancer? As we are able to analyze more precisely the data we are gathering in our large studies of other cancers (colon, cervix, bladder, ovary, etc.), we can estimate the effect, if any, of such other factors (especially coffee and alcohol).

Before a better explanation for these results can be offered, we must answer many questions about the Mormon lifestyle. For example, are stress levels among Mormons different than for non-Mormons in comparable situations? Do sleep, exercise, or eating habits differ? What is the role of the genetic component or increased longevity on certain disease processes? Work being done here and at Utah State University may make possible the extremely difficult task of analyzing a typical diet, thus enabling us to determine whether there are significant Mormon vs. non-Mormon differences and how they correlate with lower rates of bowel cancer and other disease.

Another of our Utah projects approaches the factor of activity as well, but in a different context. Utahns have long enjoyed low infant mortality rates. In a present Mormon/non-Mormon study of this phenomenon, we are selecting active LDS parents by noting children blessed by their fathers, as noted on LDS blessing certificates (assuming such children are more likely to be from active Mormon families). Our early data tend to show that active Mormons may account not only for the very low Mormon rate of infant mortality, but

also for all of Utah's low rate as well. Such results would invite us to seek out the reasons for such an occurrence.

Our initial studies on health in Mormons covered the three diseases which account for about 66% of all deaths in the United States annually—heart disease, cancer, and stroke. In the first two of these, Mormons enjoy a clear advantage over their non-Mormon neighbors, and over the general U.S. population.

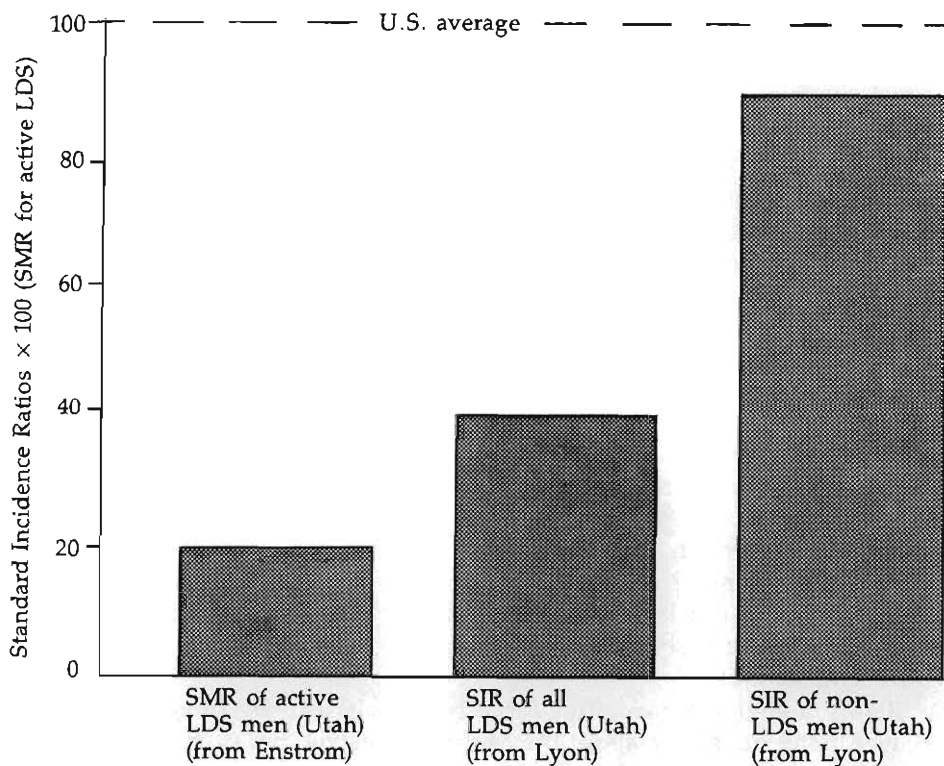


Table 5. *Crude comparison of effect of activity on incidence and mortality from lung cancer in Utah males. Incidence and mortality for lung cancer are very similar because of very low five-year survival rate.*

Abstinence from tobacco (and alcohol) may explain all the differences between Mormons and non-Mormons in cancers known to be tobacco-related, except for bladder cancer, in which an additional factor seems to be at work. Similarly, half of the reduction in heart disease among Mormons probably is attributable to abstinence from tobacco, but another important factor must be at work here as well.

Of the non-tobacco-related cancers for which differences have been found between Mormons and their neighbors, less promiscuity among the LDS may account for the lower rates of cervical cancer. Early age at first birth

among Mormon mothers probably accounts for a significant part of the reduction in breast cancer, but here again another factor must be at work. Differences in the relative incidence of other cancers—be they more (lip) or less (e.g., bowel) common among the Mormons—have yet to be associated with identifiable external factors. In particular, level of meat consumption does not appear to be related to the lower incidence of cancer of the bowel.

It is appropriate to point out that our work is statistical. Pappworth's observation that "Medical statistics are like bikinis, concealing that which is vital, while revealing much that is interesting," reminds us that there is much left to do to draw conclusive links between the Mormon lifestyle and better health. But, taken together, our studies and those of others point to a literal fulfillment of some of the promises of the Word of Wisdom. We believe that in ferreting out the specific reasons for this, we can lay hold of hidden treasures of understanding regarding the human body.

NOTES

¹For an interesting account of how the Word of Wisdom became binding on Church members, initially as an economic measure, see Leonard Arrington's account, "An Economic Interpretation of the Word of Wisdom," *BYU Studies* 1:37-49 (winter 1959).

²See Lester Bush's article "Mormon Elder Wafers," *Dialogue* Vol. X, No. 2, p. 89.

³Enstrom's data suffered from lack of an accurate age-specific denominator, and thus he made estimates of various age structures for the Mormon population and presented in his paper a range of possible rates given different age structures. A similar problem also plagues Enstrom's 1978 publication on cancer in High Priests and Seventies. Here, he has used 1975 data provided by the Church to estimate population and age structure for an earlier period of time. Our experience with the accuracy of the Church membership computer file has shown up to 15% error in estimating a population at a given point in time. We now use several methods to determine our populations.

⁴Joseph L. Lyon, et al., "Cancer Incidence in Mormons and Non-Mormons in Utah, 1966-1970," *New England Journal of Medicine* 294:129-138.

⁵These data were obtained from two control groups of 900 individuals, drawn by random digit dialing from the adult general population of Utah and age adjusted to reflect the adult population (over age twenty) of the state. The data were obtained by trained interviewers in the home of each respondent, between 1977-78. The overall response rate was 93%. These data are not yet published, but will be the basis of studies comparing LDS and non-LDS for risk factors for cancers of the uterine cervix and colon. We are not aware of any similar data which will stand careful scientific scrutiny. Either the sample was *not* random (cluster, students, volunteers), or the data were obtained in such a way as to introduce bias (interviewers from BYU, asking religion, then information on Word of Wisdom, etc.).

⁶This study was carried out between 1977-78 and involved interviewing all new cases of cervical cancer occurring in the four Wasatch Front counties and an age-matched control group chosen by random digit dialing. Response rates were 86% for controls. Special techniques were used to ascertain sexual history, with over 99% cooperation. The data will be included in a scientific paper to be published in the future.

⁷The data on age at first pregnancy in Mormons and non-Mormons comes from the earlier mentioned studies using the control groups.

⁸In an investigation of the frequency of consanguineous marriages among the Mormons and their relatives (*American Journal of Human Genetics* 8:236, 1956), C.M. Woolf, et al. found that despite the favoring of endogamous marriages by the Mormon society, ". . . the Mormon people in Utah, when compared with other populations in the world, are not inbred in the biologic sense."

⁹Joseph L. Lyon, et al., "Cardiovascular Mortality in Mormons and non-Mormons in Utah, 1969-1971," *American Journal of Epidemiology* 108:357-366.

¹⁰In this yet-to-be-published study, we took all certified cases of death from cirrhosis in Utah over a three year period and separated them by previously described methods into Mormon and non-Mormon groups.

¹¹Edward N. Robertson, "Life Table Analysis of Mormon and Non-Mormon Longevity Patterns in Utah, California, Idaho, and the United States," a thesis, 1977.

¹²James E. Enstrom, "Cancer and Total Mortality Among Active Mormons," *Cancer* 42:1943-1951, 1978.

