Vegetarian diets in the Adventist Health Study 2: a review of initial published findings[1–4]

Michael J Orlich and Gary E Fraser

ABSTRACT

The Adventist Health Study 2 is a large cohort that is well suited to the study of the relation of vegetarian dietary patterns to health and disease risk. Here we review initial published findings with regard to vegetarian diets and several health outcomes. Vegetarian dietary patterns were associated with lower body mass index, lower prevalence and incidence of diabetes mellitus, lower prevalence of the metabolic syndrome and its component factors, lower prevalence of hypertension, lower all-cause mortality, and in some instances, lower risk of cancer. Findings with regard to factors related to vegetarian diets and bone health are also reviewed. These initial results show important links between vegetarian dietary patterns and improved health.
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INTRODUCTION

Much of the current understanding of the health effects of vegetarian diets has come from a few cohort studies, especially in California Seventh-day Adventists and British vegetarians. The Adventist Health Study 2 (AHS-2) is a relatively new large cohort with a high proportion of vegetarians, which promises to add to that understanding. Here, we review the characteristics of AHS-2 and the initial published findings related to vegetarian diets.

COHORT CHARACTERISTICS

The AHS-2 is a large North American cohort. Approximately 96,000 cohort members were enrolled throughout the United States and Canada between 2002 and 2007. Recruitment for the study was done in Seventh-day Adventist churches, and the vast majority of cohort members identify themselves as Adventists. There was a special effort to recruit black subjects (including African Americans and Caribbean Americans) as an important group that has been underrepresented in scientific studies of diet and health. Approximately 27% of the cohort members are black in AHS-2, with the vast majority of others identifying as white. Sixty-five percent of subjects are women. The mean age at enrollment was 57 y. A calibration sample of more than 1100 participants was selected by using a 2-stage weighted random process, with approximately equal numbers of blacks and whites, in which food and physical activity recalls, biometric measurements, and biological samples for laboratory analysis were obtained for the purpose of validation and calibration of the cohort questionnaire data. Butler et al (1) provide a more detailed description of the cohort's characteristics and recruitment.

DIETARY PATTERNS

In the AHS-2, dietary patterns were defined along a vegetarian continuum, which can be thought of as an index of animal food avoidance. Cohort members were not asked to self-identify as vegetarians. Rather, they were categorized on the basis of their reported intakes of key food items of animal origin (*see* **Table 1** for dietary pattern definitions). Defined in this manner, 7.7% of cohort members are vegan, 29.2% are lactoovovegetarian, 9.9% are pescovegetarian, 5.4% are semivegetarian, and 47.7% are nonvegetarian. For some analyses, these 5 dietary patterns were collapsed to yield fewer categories; for example, in some cases, the 4 vegetarian categories (vegan, lactoovovegetarian, pescovegetarian, and semivegetarian) were combined together as "vegetarian" (*see* **Table 2** for select demographic, lifestyle, and nutritional characteristics for each dietary pattern category at baseline).

HEALTH OUTCOMES

The main aims of the AHS-2 are to examine the possible effects of dietary factors on the risk of specific cancers. These analyses for specific cancers will begin this year after the accrual of further incident cases to provide sufficient power. Meanwhile, several early publications from AHS-2 have examined the relation of diet to certain other health outcomes. Here we review findings relating diet to prevalent obesity, prevalent metabolic syndrome, prevalent hypertension, prevalent diabetes mellitus, incident diabetes mellitus, bone density and fracture risk, mortality, and incident cancer (considered as all cancers combined and by organ system). A summary of selected results is provided in **Table 3**.

OBESITY

As in earlier studies (10–12), vegetarians in the AHS-2 have lower BMI values. Among 60,903 participants, crude mean baseline

[1] From the Division of Cardiology, Department of Internal Medicine (GEF) and Department of Preventive Medicine (MJO), School of Medicine, and the Department of Epidemiology, Biostatistics, and Population Medicine (GEF), School of Public Health, Loma Linda University, Loma Linda, CA.

[2] Presented at the symposium "Sixth International Congress on Vegetarian Nutrition" held in Loma Linda, CA, 24–26 February 2013.

[3] Project support was obtained from the National Cancer Institute (1U01CA152939; GEF).

[4] Address correspondence and requests for reprints to MJ Orlich, Adventist Health Study 2, 24951 North Circle Drive, Nichol Hall 2031, Loma Linda, CA 92350. E-mail: morlich@llu.edu.

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TABLE 1
Definitions and prevalence of dietary patterns in the Adventist Health Study 2

	Dietary pattern				
	Vegan	Lactoovovegetarian	Pescovegetarian	Semivegetarian	Nonvegetarian
Prevalence (%)	7.7	29.2	9.9	5.4	47.7
All meats, including fish (servings)	<1/mo	<1/mo	≥1/mo	≥1/mo but ≤1/wk	>1/wk
Nonfish meat (servings)	<1/mo	<1/mo	<1/mo	≥1/mo but ≤1/wk	≥1/mo
Fish (servings)	<1/mo	<1/mo	≥1/mo	≤1/wk	Any amount
Eggs and dairy products (servings)	<1/mo	≥1/mo	Any amount	Any amount	Any amount

BMIs (in kg/m^2) were 23.6 for vegans, 25.7 for lactoovovegetarians, 26.3 for pescovegetarians, 27.3 for semivegetarians, and 28.8 for nonvegetarians (4). After adjustment for age, sex, and race, mean BMIs were 24.1 for vegans, 26.1 for lactoovovegetarians, 26.0 for pescovegetarians, 27.3 for semivegetarians, and 28.3 for nonvegetarians among 73,308 participants (2).

METABOLIC SYNDROME

Rizzo et al (7) examined the relation of dietary patterns to metabolic syndrome and its component risk factors in the calibration sample of the AHS-2 (n = 773). Diets were considered in 3 categories: vegetarian (vegan plus lactoovovegetarian), semivegetarian (pescovegetarian plus semivegetarian), and

TABLE 2
Select baseline characteristics by dietary pattern category

	Dietary pattern				
	Vegan	Lactoovovegetarian	Pescovegetarian	Semivegetarian	Nonvegetarian
Age,[1,2] (y)	57.9 ± 13.6	57.5 ± 13.9	58.8 ± 13.7	57.8 ± 14.1	55.9 ± 13.1
Female sex[1] (%)	63.8	64.9	68.0	69.7	65.3
Race, black[1] (%)	21.0	13.6	39.1	17.8	34.0
Marital status, married[1] (%)	75.6	76.3	73.1	71.5	70.3
Educational level[1] (%)					
High school or less	16.7	13.9	18.4	21.3	24.4
Trade, associate, some college	39.4	35.7	38.1	39.2	42.2
Bachelor's degree	24.4	25.3	23.0	21.3	19.2
Graduate degree	19.5	25.1	20.5	18.3	14.1
Alcohol consumption[1] (%)					
None	98.8	96.8	92.5	92.4	83.4
Rare	0.6	1.8	4.0	4.2	7.5
Monthly	0.2	0.5	1.1	1.1	3.1
Weekly	0.3	0.7	1.9	2.0	4.7
Daily	0.1	0.2	0.5	0.3	1.3
Smoking[1] (%)					
Never	85.0	88.2	84.1	81.4	75.7
Former	14.9	11.7	15.5	18.3	22.3
Current	0.1	0.1	0.4	0.3	2.0
Exercise[1,3] (%)					
None	15.1	17.3	18.0	20.6	23.4
1–20 min/wk	16.2	18.6	16.8	20.5	20.0
21–60 min/wk	16.1	16.5	16.2	16.1	15.8
61–150 min/wk	27.8	26.8	27.5	24.5	23.6
≥151 min/wk	24.8	20.8	21.6	18.3	17.2
Energy intake[1,2] (kcal/d)	1897 ± 729	1912 ± 735	1939 ± 772	1720 ± 713	1884 ± 773
Macronutrients[4,5] (% of energy)					
Carbohydrate	58.1 ± 0.1	54.3 ± 0.1	54.5 ± 0.1	53.9 ± 0.1	51.4 ± <0.1
Fat	28.2 ± 0.1	31.9 ± 0.1	31.3 ± 0.1	32.2 ± 0.1	33.8 ± <0.1
Protein	13.6 ± <0.1	13.7 ± <0.1	14.2 ± <0.1	13.7 ± <0.1	14.7 ± <0.1
Select nutrients[4,5] (g/d)					
Total fiber	46.7 ± 0.1	37.5 ± 0.1	37.7 ± 0.1	34.9 ± 0.1	30.4 ± <0.1
SFAs	11.6 ± 0.1	16.0 ± 0.1	15.8 ± 0.1	17.4 ± 0.1	19.9 ± <0.1
Animal protein	3.1 ± 0.2	12.2 ± 0.1	16.0 ± 0.2	17.6 ± 0.2	31.8 ± 0.1

[1] Results from reference 2 (n = 73,308). Adjusted for age, sex, and race (as appropriate) by direct standardization.
[2] Values are means ± SDs.
[3] Exercise defined as "vigorous activities, such as brisk walking, jogging, bicycling, etc, long enough or with enough intensity to work up a sweat, get your heart thumping, or get out of breath."
[4] Results from reference 3 (n = 71,751). Mean nutrient intake values standardized to 2000 kcal/d, adjusted for age, sex, and race.
[5] Values are means ± SEs.

TABLE 3
Summary of the association of vegetarian dietary patterns with selected health outcomes in the Adventist Health Study 2

	Dietary pattern				
Health Outcome[1]	Vegan	Lactoovovegetarian	Pescovegetarian	Semivegetarian	Nonvegetarian
Cross-sectional findings					
BMI[2] (4) (kg/m^2)	23.6 ± 4.4	25.7 ± 5.1	26.3 ± 5.2	27.3 ± 5.7	28.8 ± 6.3
Diabetes[3] (4) [OR (95% CI)]	0.51 (0.40, 0.66)	0.54 (0.49, 0.60)	0.70 (0.61, 0.80)	0.76 (0.61, 0.80)	Referent
Prevalence (%)	2.9	3.2	4.8	6.1	7.6
Hypertension [OR (95% CI)]					
Nonblacks[4] (5)	0.37 (0.19, 0.74)	0.57 (0.36, 0.92)	0.92 (0.70, 1.50)		Referent
Blacks[5] (6)	0.56 (0.36, 0.87)		0.94 (0.54, 1.63)	Not reported	Referent
Metabolic syndrome[6,7] (7) [OR (95% CI)]	0.44 (0.30, 0.64)		Not reported		Referent
Prevalence[6] (%)	25.2		37.6		39.7
Prospective findings					
Diabetes[8] (8) [OR (95% CI)]	0.38 (0.24, 0.62)	0.62 (0.50, 0.76)	0.79 (0.58, 1.09)	0.49 (0.31, 0.76)	Referent
n	3545	14,099	3644	2404	17,695
Incident cases (%)	0.54	1.08	1.29	0.92	2.12
All cancers[9] (9) [HR (95% CI)]	0.84 (0.72, 0.99)	0.93 (0.85, 1.02)	0.88 (0.77, 1.01)	0.98 (0.82, 1.17)	Referent
n	4922	19,735	6846	3881	33,736
No. of events	190	878	276	182	1413
All-cause mortality[10] (2) [HR (95% CI)]	0.85 (0.73, 1.01)	0.91 (0.82, 1.00)	0.81 (0.69, 0.94)	0.92 (0.75, 1.13)	Referent
n	5548	21,777	7194	4031	35,359
No. of events	197	815	251	160	1147

[1] Numbers in parentheses are reference numbers.
[2] Values are means ± SDs.
[3] Logistic regression model, adjusted for age, sex, race, BMI, physical activity, education, income, sleep, television watching, and alcohol consumption.
[4] Pescovegetarians and semivegetarians were considered together as partial vegetarians because of the small numbers in both categories (logistic regression model, adjusted for age, sex, and exercise).
[5] Vegans and lactoovovegetarians were considered together as vegetarians because of the small number of vegans (logistic regression model, adjusted for age, sex, education, and physical activity).
[6] Vegans and lactoovovegetarians were considered together as vegetarians because of the small number of vegans; pescovegetarians and semivegetarians were considered together as semivegetarians because of the small numbers in both categories.
[7] Logistic regression model, adjusted for age, sex, ethnicity, physical activity, smoking, alcohol consumption, and dietary energy.
[8] Logistic regression model, adjusted for age, sex, race, BMI, physical activity, education, income, sleep, television watching, smoking, and alcohol consumption (2-y follow-up).
[9] Cox proportional hazards regression model, adjusted for age, race, family history of cancer, education, smoking, alcohol consumption, age at menarche, pregnancies, breastfeeding, oral contraceptive use, hormone replacement therapy, and menopausal status (4.14-y average follow-up).
[10] Cox proportional hazards regression model, adjusted for age, sex, race, smoking, exercise, personal income, educational level, marital status, alcohol, geographic region, menopause (in women), and hormone therapy (in postmenopausal women) (5.79-y average follow-up).

nonvegetarian. In ANCOVA analysis, with adjustment for age, sex, ethnicity, smoking, alcohol intake, physical activity, and dietary energy intake, significant differences between the dietary groups were found for all of the metabolic syndrome components except for HDL (triglycerides, diastolic blood pressure, systolic blood pressure, waist circumference, BMI, and glucose), with vegetarians having more favorable levels in each case. Considering metabolic syndrome as a whole, the prevalence was 25.2%, 37.6%, and 39.7% for vegetarians, semivegetarians, and nonvegetarians, respectively; and in logistic regression analysis with adjustment for the same potential confounders, vegetarians had 0.44 (95% CI: 0.30, 0.64) times the odds of having metabolic syndrome as did nonvegetarians (7).

HYPERTENSION

Pettersen et al (5) examined the relation of dietary patterns to prevalent hypertension among whites in the calibration sample (n = 500). Diets were considered in 4 categories: vegans, lactoovovegetarians, partial vegetarians (pescovegetarians plus semivegetarians), and nonvegetarians. In a logistic regression analysis that controlled for age, sex, and exercise, the adjusted ORs of having hypertension were 0.37 (95% CI: 0.19, 0.74) and 0.57 (95% CI: 0.36, 0.92) for vegans and lactoovovegetarians, respectively, compared with nonvegetarians (5). Additional adjustment for BMI (a possible causal intermediate) attenuated the results to 0.53 (95% CI: 0.25, 1.11) and 0.86 (95% CI: 0.51, 1.45), respectively. A subsequent analysis (6) showed similar findings in black subjects (n = 592). In a logistic regression analysis that adjusted for age, sex, education, and physical activity, the OR for prevalent hypertension among vegetarians (vegans and lactoovovegetarians combined) was 0.56 (95% CI: 0.36, 0.87) compared with nonvegetarians.

DIABETES MELLITUS

The relation of vegetarian diets to both prevalent and incident diabetes mellitus has been examined in AHS-2. Prevalence of type 2 diabetes was 2.9% among vegans, 3.2% among lactoovovegetarians, 4.8% among pescovegetarians, 6.1% among semivegetarians, and 7.6% among nonvegetarians (4). In logistic regression analysis, compared with nonvegetarians, the multivariate adjusted (for age, sex, ethnicity, education, income, physical activity, television watching, sleep habits, alcohol use, and BMI) ORs for prevalent type 2 diabetes were 0.51 (95% CI: 0.40, 0.66) for vegans, 0.54 (95% CI: 0.49, 0.60) for lactoovovegetarians, 0.70 (95% CI: 0.61, 0.80) for pescovegetarians, and 0.76 (95% CI: 0.65, 0.90) for semivegetarians (4).

Among 41,387 participants who did not report having diabetes mellitus at baseline, diabetes incidence was calculated from a response to a follow-up questionnaire at 2 y. The percentage who reported developing diabetes was 0.54% in vegans, 1.08% in lactoovovegetarians, 1.29% in pescovegetarians, 0.92% in semivegetarians, and 2.12% in nonvegetarians (8). In multivariate adjusted (for age, sex, education, income, television watching, physical activity, sleep, alcohol use, smoking, and BMI) logistic regression analysis, ORs for developing diabetes compared with nonvegetarians were 0.38 (95% CI: 0.24, 0.62) for vegans, 0.62 (95% CI: 0.50, 0.76) for lactoovovegetarians, 0.79 (95% CI: 0.58, 1.09) for pescovegetarians, and 0.49 (95% CI: 0.31, 0.76) for semivegetarians (8). Similar analyses stratified by race found reductions in odds among blacks for the vegan (0.30; 95% CI: 0.11, 0.84) and lactoovovegetarian (0.47; 95% CI: 0.27, 0.83) dietary patterns and among nonblacks for the vegan (0.43; 95% CI: 0.25, 0.74), lactoovovegetarian (0.68; 95% CI: 0.54, 0.86), and semivegetarian (0.50; 95% CI: 0.30, 0.83) dietary patterns (8).

OSTEOPOROSIS

The relation of diet to osteoporosis risk is complex, and the scientific understanding of it is incomplete. In particular, there is conflicting evidence with regard to the relation of protein intake (particularly animal protein) with bone density and fracture risk (13–18). Thorpe et al (19) examined the relation of protein-rich foods of both animal and plant origin to the incidence of wrist fracture over 25 y among 1865 women who were participants in both the AHS-1 and AHS-2. Higher consumption of protein-rich foods of both animal and plant origin was found to be protective. In Cox proportional hazards regression analysis, among those with the lowest consumption of animal protein (vegetarians), those who consumed protein-rich plant foods more than once per day had an HR of 0.32 (95% CI: 0.13, 0.79) for wrist fracture compared with those consuming plant protein foods $<$3 times/wk (19). Similarly, among those with the lowest consumption of plant protein foods, those who consumed meat $>$4 times/wk had an HR for wrist fracture of 0.20 (95% CI: 0.06, 0.66) compared with those not consuming meat (19).

Dairy products are generally thought to be good sources of dietary protein and calcium, raising the concern that reduced dairy product consumption among vegetarians, particularly vegans, may increase the risk of osteoporosis. Many vegetarians (and many nonvegetarians) use soy milk or other types of milk substitutes to replace dairy consumption. Matthews et al (20) examined whether soy milk consumption might confer similar benefits on bone health as dairy product consumption. Among 337 postmenopausal white women from AHS-2 evaluated for osteoporosis by broadband ultrasound attenuation of the calcaneus, the multivariate adjusted OR for osteoporosis for those consuming $\geq$1 servings dairy products/d compared with those consuming dairy less than twice per week was 0.38 (95% CI: 0.17, 0.86) (20). These analyses come from a logistic regression model in which both soy milk consumption and dairy product consumption were included. The OR for those consuming $\geq$1 servings soy milk/d compared with those not consuming soy milk was 0.44 (95% CI: 0.20, 0.98) (20). Thus, soy milk appeared to be associated with improved bone health to a similar degree as dairy products, suggesting that it may provide a useful alternative to dairy in certain vegetarian diets. This finding may be related to the protein content of soy milk and, in the case of many fortified soy milks, the calcium content. The protein content of unfortified soy milk is 3.27 g/100 g, compared with 3.15 g/100 g for whole milk; the calcium contents of unfortified and fortified soy milks are 25 mg/100 g and 123 mg/100 g, respectively, compared with a calcium content of 113 mg/100 g for whole milk (21).

CANCER

Tantamango-Bartley et al (9) recently published an initial analysis of the association of dietary patterns with cancer incidence in AHS-2. Because this was early follow-up, there was not yet sufficient power to analyze the effect on specific cancers. However, interesting results were shown in analyses of all incident cancers and of cancers categorized by organ system. Among 69,120 participants included in the analysis, there were 2939 incident cancers. In multivariate adjusted (for age, race, family history of cancer, education, smoking, alcohol, age at menarche, pregnancies, breastfeeding, oral contraceptives, hormone replacement therapy, and menopause status) Cox proportional hazards regression analyses comparing all vegetarians combined (vegans, lactoovovegetarians, pescovegetarians, and semivegetarians) with nonvegetarians, significant reductions in risk were found for all cancers (HR: 0.92; 95% CI: 0.85, 0.99) and gastrointestinal system cancers (HR: 0.76; 95% CI: 0.63,0.90) (9). When the 4 vegetarian groups were compared separately with the nonvegetarian referent group, reduced risk was found in vegans for all cancer (HR: 0.84; 95% CI: 0.72, 0.99) and for female-specific cancers (HR: 0.66; 95% CI: 0.47, 0.92) and in lactoovovegetarians for gastrointestinal system cancers (HR: 0.75; 95% CI: 0.60, 0.92) (9).

MORTALITY

A longevity advantage for those who consume vegetarian diets was previously shown in the AHS-1 cohort (12, 22). On the other hand, a reduction in all-cause mortality has not been associated with vegetarian dietary patterns in the European Prospective Investigation into Cancer and Nutrition–Oxford cohort (23). Orlich et al (2) examined the possible association of vegetarian dietary patterns with all-cause mortality and broad categories of cause-specific mortality in AHS-2. After a mean follow-up of 5.79 y (n = 73,308), Cox proportional hazards regression analysis (adjusting for age, race, sex, smoking, exercise, education, marital status, alcohol, geographic region, menopause, and hormone therapy) showed reduced all-cause mortality for all vegetarians compared with nonvegetarians (HR: 0.88; 95% CI: 0.80, 0.97). For specific dietary patterns, the HRs were 0.85 (95% CI: 0.73, 1.01) for vegans, 0.91 (95% CI: 0.82, 1.00) for lactoovovegetarians, 0.81 (95% CI: 0.69, 0.94) for pescovegetarians, and 0.92 (95% CI: 0.75, 1.13) for semivegetarians. Effects were stronger in men and less often significant in women. Apparent beneficial associations were seen in some cases for mortality from cardiovascular, renal, and endocrine diseases (2).

DISCUSSION

Because of its relatively large number of vegetarians, the AHS-2 is a valuable cohort for the study of the possible effects of vegetarian dietary patterns on various health outcomes. The initial published results, reviewed previously, show a number of apparent health benefits of vegetarian diets. Vegetarian diets in AHS-2 are associated with lower BMI values, lower prevalence of hypertension, lower prevalence of the metabolic syndrome, lower prevalence and incidence of diabetes mellitus, and lower all-cause mortality. Initial analyses also showed possible moderate reductions in the rates of certain cancer outcomes for some vegetarians. The bone health research presented here links inadequate protein amounts to an increased risk of osteoporosis and fractures; however, it appears to show that plant sources of protein, like animal sources, decrease this risk.

As with all observational research, caution must be exercised in inferring causation from the results reviewed here. Although appropriate attempts at adjustment for possible confounders were made in each case, it remains possible that some uncontrolled confounding may explain all or part of these findings. Measurement error is another challenge and potential source of bias in nutritional studies (24), but this would seem less likely to affect analyses by broad dietary pattern than analyses according to the intake of specific foods or nutrients.

Although large, high-quality clinical trials examining the effects of vegetarian dietary patterns on major health outcomes have not been conducted as they have for the Mediterranean dietary pattern (25, 26), small interventional studies provide indirect support for some findings presented here, particularly in regard to reduced weight (27–32), improvements in serum lipid concentrations (33–37), and improvements in control of diabetes mellitus (27, 38, 39) with vegetarian diets.

The dietary patterns described here are defined according to the avoidance of certain foods of animal origin. However, the shown associations may not always be related to reduced animal product consumption. They may also result from an increase in nutritional components related to plant foods, such as the increased fiber intake (Table 2). There may also be considerable heterogeneity of food and nutrient consumption within each vegetarian-spectrum dietary pattern, as we have previously discussed (40), so additional analyses by food, nutrient, or dietary indexes will be of value. As with all diets, vegetarian diets should be carefully planned for nutritional adequacy. Nutrients of possible concern for vegetarian diets include vitamin B-12 (particularly for vegans), iron, calcium, zinc, vitamin D, and protein (41). Rizzo et al (3) analyzed the nutrient profiles of the 5 dietary patterns described here in detail and reported considerable variation by diet pattern. In no cases were mean values of potentially marginal nutrients less adequate among vegetarians than among nonvegetarians, but some individuals in the tails of the distributions may have had inadequate intakes.

POTENTIAL MECHANISMS

Although analysis by dietary pattern is advantageous in terms of real-world relevance and avoids many of the problems of reductionist models, a major disadvantage of this approach is its remoteness from specific mechanistic hypotheses. Various mechanisms, known and unknown, may link vegetarian dietary patterns to improved health outcomes, and a full discussion of these is beyond the scope of this brief review; however, we offer a few comments.

Adiposity is a core feature of the metabolic syndrome and an important risk factor for diabetes mellitus, cardiovascular disease, and certain cancers. Thus, the stepwise increase in BMI values from vegan (lowest) to nonvegetarian (highest) presented here is noteworthy and may serve as an important intermediate in pathways of causation leading from dietary pattern to disease. The reason for this BMI gradient is not well understood. Caloric intakes are similar among the 5 dietary pattern groups (3). Significant differences in BMI persist after control for both dietary energy intake and physical activity (7). Vegetarian diets may result in differences in energy absorption and utilization that lead to differences in BMI. The results for diabetes mellitus reviewed here are interesting in that significant reductions in risk for vegetarians remained after BMI was controlled for. Some of this remaining effect may still be mediated by differences in adiposity not fully captured by BMI (central adiposity, visceral adiposity); however, mechanisms entirely independent of adiposity may also be in effect.

Differences in the intake of specific nutrients may mediate some of the effects of vegetarian dietary patterns. For example, vegetarians have higher intakes of potassium (3), which is considered an important micronutrient for the prevention of hypertension. Tantamango-Bartley et al (9) provided a discussion of many possible mechanisms linking vegetarian dietary patterns to reduced cancer risk; in particular, they discussed the possibility that increased soy consumption among vegetarians could be relevant to their finding of a reduction in risk of female-specific cancers among vegans (9).

ONGOING AHS-2 RESEARCH

The primary aim of the AHS-2 is to investigate potential connections between dietary factors and the risk of specific cancers. To this end, we are attempting record linkages with the cancer registries of all 50 states and all Canadian provinces, something that, to our knowledge, has not previously been done. This process is well advanced, and we anticipate important publications on the relation of diet to specific major cancers starting in 2014. We are hopeful that these ongoing and future analyses will add to our understanding of the relation of vegetarian dietary patterns to health and longevity.

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