

Employee Dietary Initiative Improved Chronic Symptoms

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Abstract

With the awareness that the Standard American Diet is a critical contributor to chronic diseases, this initiative aimed to assess the effects of a 28-day dietary challenge health care improvement project on health system employee energy level, sleep quality, gastrointestinal function, ability to concentrate, and aches/pains, including the impact of adherence level, during a period of restricted intake of gluten, dairy, and sugar offered annually from 2021 to 2023. A total of 754 employees completed the pre-challenge survey; analyses included 354 employees who completed both pre-challenge and post-challenge surveys in at least 1 year of this project. Wilcoxon signed rank tests compared presurvey and postsurvey responses to self-reported energy level, sleep quality, gastrointestinal function, ability to concentrate, and aches/pains. Analysis of variance with Tukey's honestly significant difference tests compared self-reported adherence level with change scores, with η^2 representing effect size. In each challenge year, the mean rank levels of energy, sleep quality, gastrointestinal function, concentration, and aches/pains improved significantly between pre-surveys and post-surveys (all $P < .001$). Although an association between significant positive change and diet adherence level was found for all items in at least 1 challenge year, those who mostly or completely adhered to the challenge diet restrictions reported significantly greater positive change in energy levels and gastrointestinal symptoms than those who did not or minimally adhered in all challenge years, with small to medium effect sizes. In conclusion, Essentia Health's employee challenge appeared to improve self-reported outcomes in 5 symptom domains, with energy levels and gastrointestinal symptoms correlating most favorably to adherence to the challenge. These findings have health and cost implications, which could be confirmed by formal research in employee and other populations.

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Diet is considered to be the most important preventable risk factor for chronic disease.¹ The Standard American Diet (SAD), which includes an abundance of calorie dense and nutrient poor foods, has been shown to be associated with obesity, vascular disease, diabetes, cancer, and inflammatory conditions.²⁻⁴ Roughly half of Americans have at least 1 preventable chronic disease, placing a burden on health systems, individuals, families, and the economy.⁵

Chronic symptoms are typical of chronic disease and curtail optimal well-being and performance; inflammation is a common pathway influencing chronic disease and symptom burden.⁶ Considerable attention has recently been given to anti-inflammatory diets and

other nutritional strategies for improving symptoms and preventing disease.⁷⁻¹¹

Although no clear consensus exists on all aspects of an anti-inflammatory diet or an ideal diet for all populations, foods that are considered anti-inflammatory by nature typically include whole foods like fruits/vegetables, nuts/seeds, fatty fish, olive oil, herbs/spices, and legumes, whereas foods that are known to be inflammatory include sugar, refined carbohydrates, fried foods, highly processed foods/oils, and alcohol.^{12,13} Whole grains, considered part of a healthy diet, may not be well-tolerated in some patients, possibly related to gluten sensitivity, which, in addition to celiac disease, has been associated with arthritis, irritable bowel syndrome, migraine headaches, depression, and other conditions.^{14,15}

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Health Reset Dietary Challenge Health Care Improvement Project

Essentia Health, a self-insured integrated rural health delivery system headquartered in Duluth, MN and serving patients in Minnesota, Wisconsin, and North Dakota, implemented an employee-based initiative called the Health Reset to evaluate and improve employee health from 2021 to 2023.

The aim of this health care improvement project was to evaluate the Health Reset dietary challenge's effect on participants' self-reported energy levels, sleep quality, gastrointestinal function, ability to concentrate, and aches/pains in each of the 3 project years.

METHODS

Context

At the time of this health care improvement project, Essentia Health had nearly 15,000 employees, including 2100 physicians and advanced practitioners. It currently staffs 14 hospitals, 78 clinics, 6 long-term care facilities, 6 assisted living and independent living facilities, 7 ambulance services, 27 retail pharmacies, and 1 research institute. The sample included employees who took part in the Health Reset dietary challenge in 2021, 2022, and 2023.

Ethical Considerations

This health care improvement project was determined to not be research conducted with human subjects by Essentia Health's human subjects' protection program; thus, the health system's institutional review board was not required to provide an exemption letter for this project.

Intervention

The Health Reset was offered to Essentia Health employees who took part in an employment wellness program annually in 2021, 2022, and 2023 as a challenge for which points could be accrued toward their health savings accounts. The Health Reset challenge was also mentioned in a system-wide weekly digest email to employees in each project year. The challenge aimed to report to participants the influence that their diets may have on their physical symptoms in 5 domains: energy level, sleep quality, gastrointestinal

function, ability to concentrate, and aches/pains. The 28-day duration of the challenge was chosen so as to not far exceed the typical challenge length, generally up to 21 days. The half-life of food protein immunoglobulin G antibodies is around 3 weeks;¹⁶ 28 days can be sufficient for food elimination in many cases for which immunoglobulin G-mediated immune response is a primary driver of symptoms without causing nutritional imbalances.

Participants were offered a physician-guided, 28-day nutritional challenge that removed dairy products, gluten-containing foods, and sugar from their diets in 2021, 2022, and 2023. An extensive guide (see [Supplemental Material](#), available online at <http://www.mcpiqjournal.org>) was provided, detailing the rationale for the intervention and foods to include and avoid. Recipes were also included.

Weekly live question and answer sessions were provided before, during, and after each challenge period as foods were reintroduced. There were ~6 sessions per challenge. Recordings of these sessions were made available to participants on the social media platform Yammer (now Viva Engage), hosted by the institution. Participants used this platform extensively to encourage one another, ask questions, and post recipes and other information.

Survey

Survey questions (see Tables) were developed by a health care improvement project team member in collaboration with the physician lead.

Data Analysis

Only participants who completed both the pre-challenge and post-challenge surveys in a given year were included in analyses completed by the last author (MH). Demographic characteristics of Health Reset challenge participants were described using univariate statistics. The Wilcoxon signed rank test for matched pairs was used to compare presurvey and postsurvey responses to scale (1-10) items: "Please rate your current energy level" (energy level) (1=very low energy level, 10=very high energy level); "Please rate any aches and pains you may currently be experiencing (including headaches)" (aches/

TABLE 1. Health Reset Dietary Challenge 2021–2023: Survey Completers and Postsurvey Categorical Questions

	2021		2022		2023	
	n	%	n	%	n	%
Completed pre-challenge survey	282	100.0	356	100.0	351	100.0
Completed pre-challenge and post-challenge surveys	166	58.9%	187	52.5	153	43.6
Postsurvey: how closely did you adhere to the challenge guidelines?						
Did not adhere (did not eliminate any of the recommended foods or decrease consumption)	3	1.8	3	1.6	4	2.6
Adhered minimally (did not eliminate any of the recommended foods but cut back on consumption overall)	13	7.8	18	9.6	14	9.2
Adhered somewhat (eliminated 1 or 2 of the 3 recommended foods or not consistently)	58	34.9	77	41.2	78	51.0
Adhered mostly (eliminated dairy, gluten or sugar but had a couple slip-ups)	74	44.6	71	38.0	49	32.0
Adhered completely (complete elimination of dairy, gluten, or sugar)	18	10.8	18	9.6	8	5.2
Postsurvey: what did you find most helpful about the challenge (select all that apply)						
Challenge guide	131	78.9	152	81.3	132	86.3
Yammer group	118	71.1	109	58.3	51	33.3
Weekly support sessions	74	44.6	75	40.1	47	30.7
I did not find any of the challenge materials helpful	0	.0	4	2.1	3	2.0
Missing	-	-	1	.5	2	1.3
Postsurvey: Do you plan on maintaining any of the modifications you made throughout the challenge?						
No	3	1.8	4	2.1	3	2.0
Yes	132	79.5	127	67.9	105	68.6
Maybe	31	18.7	55	29.4	44	28.8
Missing	0	.0	1	.5	1	.7

Participants who only completed the post-challenge survey (no matching pre-challenge survey) in a given year were excluded. Some participants also completed either the pre-challenge or post-challenge survey twice, and the duplicate survey was excluded.

pains) (1=no pain, 10=extreme pain); “Please rate any sleep difficulties you may be experiencing” (sleep difficulties) (1=no sleep trouble, 10=extreme sleep trouble); “Please rate any digestive issues you may be experiencing” (digestive issues) (1=no digestive issues, 10 =extreme digestive issues); “Please rate any difficulty concentrating you may be experiencing” (concentration difficulties) (1=no trouble concentrating, 10=extreme difficulty concentrating). Change variables were also created between presurvey and postsurvey responses to the energy level, aches and pains, sleep difficulties, digestive issues, and concentration difficulties questions, with all but change in energy level reverse coded to show improvements as positive values. Analysis of variance (ANOVA) and post hoc Tukey honestly significant difference tests were then used to compare mean change scores between grouped postsurvey diet adherence levels (0=did not/minimally adhered, 1=somewhat

adhered, 2=mostly/completely adhered) for each project year separately. All change variables were normally distributed for each project year, with nonsignificant Levene’s test for equality of variances in each year, showing that variances were equal as required in ANOVA. Effect sizes were assessed using η^2 , where .01 represented a small, .06 a medium, and .14 a large effect.¹⁷ Data were analyzed in IBM SPSS Statistics 29 (IBM Corp, 1998–2022). Missing data were excluded using listwise deletion. Comparisons were considered statistically significant at $P<.05$. We followed SQUIRE 2.0 guidelines in the preparation of this manuscript (<https://www.squire-statement.org>).

RESULTS

Over the 3 Health Reset dietary challenge years, 754 unique employees took the pre-challenge survey at least once, with 562 taking it in a single year, 149 taking it in 2 separate

TABLE 3. Health Reset Dietary Challenge Diet Adherence Descriptive Statistics and ANOVA for Postdietary Challenge Change Scores by Year and Dietary Challenge Adherence Level^a

Dependent Variable	Challenge Diet Adherence	n	Mean	SD	SE	ANOVA Comparison	Sum of Squares	df	Mean Square	F	P
2021											
Change in energy level	Did not/minimally	16	.75	1.44	.36	Between groups	46.83	2	23.42	8.02	<.001 ^b
	Somewhat	57	1.25	1.70	.23	Within groups	472.78	162	2.92		
	Mostly/completely	92	2.17	1.75	.18	Total	519.61	164			
	Total	165	1.72	1.78	.14						
Change in aches/pains ^c	Did not/minimally	16	1.75	1.69	.42	Between groups	13.60	2	6.80	1.52	.22
	Somewhat	57	1.28	2.02	.27	Within groups	720.62	161	4.48		
	Mostly/completely	91	1.90	2.24	.23	Total	734.22	163			
	Total	164	1.67	2.12	.17						
Change in sleep difficulties ^c	Did not/minimally	15	2.00	2.67	.69	Between groups	12.58	2	6.29	1.26	.29
	Somewhat	56	1.34	1.91	.26	Within groups	791.84	158	5.01		
	Mostly/completely	90	1.91	2.35	.25	Total	804.42	160			
	Total	161	1.72	2.24	.18						
Change in digestive issues ^c	Did not/minimally	15	1.40	1.76	.46	Between groups	46.33	2	23.17	4.84	.009 ^b
	Somewhat	54	1.31	1.98	.27	Within groups	722.14	151	4.78		
	Mostly/completely	85	2.44	2.37	.26	Total	768.47	153			
	Total	154	1.94	2.24	.18						
Change in concentration difficulties ^c	Did not/minimally	16	1.50	1.93	.48	Between groups	4.51	2	2.25	.63	.54
	Somewhat	58	1.60	1.84	.24	Within groups	575.16	160	3.59		
	Mostly/completely	89	1.91	1.92	.20	Total	579.67	162			
	Total	163	1.76	1.89	.15						
2022											
Change in energy level	Did not/minimally	21	.62	1.75	.38	Between groups	58.95	2	29.47	12.14	<.001 ^b
	Somewhat	77	.86	1.46	.17	Within groups	446.83	184	2.43		
	Mostly/completely	89	1.92	1.60	.17	Total	505.78	186			
	Total	187	1.34	1.65	.12						
Change in aches/pains ^c	Did not/minimally	21	.33	1.71	.37	Between groups	58.50	2	29.25	7.33	.001 ^b
	Somewhat	77	1.06	1.91	.22	Within groups	730.06	183	3.99		
	Mostly/completely	88	1.94	2.13	.23	Total	788.56	185			
	Total	186	1.40	2.06	.15						
Change in sleep difficulties ^c	Did not/minimally	21	1.57	2.18	.48	Between groups	30.41	2	15.21	3.22	.04 ^b
	Somewhat	76	1.68	2.25	.26	Within groups	855.24	181	4.73		
	Mostly/completely	87	2.47	2.10	.23	Total	885.65	183			
	Total	184	2.04	2.20	.16						
Change in digestive issues ^c	Did not/minimally	20	.95	2.35	.53	Between groups	46.49	2	23.24	4.00	.02 ^b
	Somewhat	76	1.57	2.19	.25	Within groups	1046.10	180	5.81		
	Mostly/completely	87	2.38	2.60	.28	Total	1092.59	182			
	Total	183	1.89	2.45	.18						
Change in concentration difficulties ^c	Did not/minimally	21	.43	2.20	.48	Between groups	62.24	2	31.12	6.41	.002 ^b
	Somewhat	76	1.37	2.34	.27	Within groups	883.92	182	4.86		
	Mostly/completely	88	2.18	2.08	.22	Total	946.16	184			
	Total	185	1.65	2.27	.17						
2023											
Change in energy level	Did not/minimally	18	.72	1.93	.46	Between groups	42.08	2	21.04	9.29	<.001 ^b
	Somewhat	78	1.13	1.44	.16	Within groups	339.70	150	2.26		
	Mostly/completely	57	2.11	1.44	.19	Total	381.78	152			
	Total	153	1.44	1.58	.13						

Continued on next page

TABLE 3. Continued

Dependent Variable	Challenge Diet Adherence	n	Mean	SD	SE	ANOVA Comparison	Sum of Squares	df	Mean Square	F	P
Change in aches/pains ^c	Did not/minimally	18	.83	1.76	.41	Between groups	10.36	2	5.18	1.36	.26
	Somewhat	76	1.32	1.93	.22	Within groups	563.59	148	3.81		
	Mostly/completely	57	1.67	2.03	.27	Total	573.95	150			
	Total	151	1.39	1.96	.16						
Change in sleep difficulties ^c	Did not/minimally	18	1.00	1.57	.37	Between groups	28.46	2	14.23	3.56	.03 ^b
	Somewhat	76	1.16	2.04	.23	Within groups	591.09	148	3.99		
	Mostly/completely	57	2.02	2.06	.27	Total	619.55	150			
	Total	151	1.46	2.03	.17						
Change in digestive issues ^c	Did not/minimally	18	.72	2.16	.51	Between groups	46.16	2	23.08	4.35	.01 ^b
	Somewhat	77	1.52	2.30	.26	Within groups	790.34	149	5.30		
	Mostly/Completely	57	2.39	2.35	.31	Total	836.50	151			
	Total	152	1.75	2.35	.19						
Change in concentration difficulties ^c	Did not/minimally	18	.06	2.24	.53	Between groups	46.99	2	23.49	6.51	.002 ^b
	Somewhat	78	1.59	1.69	.19	Within groups	541.18	150	3.61		
	Mostly/completely	57	1.89	2.06	.27	Total	588.17	152			
	Total	153	1.52	1.97	.16						

^aAbbreviations: df, degrees of freedom; SD, standard deviation; SE, standard error.

^bSignificant differences at $P < .05$.

^cReverse coded.

digestive issues ($F[2, 180]=4.00$; $P=.02$), and concentration difficulties ($F[2, 182]=6.41$; $P=.002$). The change in energy level again had the highest effect size ($\eta^2=.12$, 95% CI, .04-.20) (Table 4). Participants who mostly/completely adhered to the diet had significantly greater improvement in: energy levels ($M=1.9$, $SD=1.6$) versus those who did not/minimally ($M=.6$, $SD=1.8$, $P=.002$) and somewhat adhered ($M=.9$, $SD=1.5$, $P<.001$); aches/pains ($M=1.9$, $SD=2.1$) versus did not/minimally ($M=.3$, $SD=1.7$, $P=.003$) and somewhat adhered ($M=1.1$, $SD=1.9$, $P=.01$); digestive issues ($M=2.4$, $SD=2.6$) versus those who did not/minimally adhered ($M=1.0$, $SD=2.4$, $P=.047$); and difficulty concentrating ($M=2.2$, $SD=2.1$) versus those who did not/minimal adhered ($M=.4$, $SD=2.2$, $P=.004$) (Table 5).

In 2023 (Table 3), aside from aches/pains, 4 change variables differed significantly based on adherence level: energy level ($F[2, 150]=9.29$, $P<.001$), sleep difficulties ($F[2, 148]=3.56$, $P=.03$), digestive issues ($F[2, 149]=4.35$, $P=.02$), and concentration difficulties ($F[2, 150]=6.51$, $P=.002$). As in previous years, energy level had the highest effect size ($\eta^2=.11$, 95% CI, .03-.20) (Table 4).

Participants who mostly/completely adhered to the diet had significantly greater improvement in: energy levels ($M=2.1$, $SD=1.4$) versus those who did not/minimally ($M=.7$, $SD=1.9$, $P=.002$) or somewhat adhered ($M=1.1$, $SD=1.4$, $P<.001$); sleep difficulties ($M=2.0$, $SD=2.1$) versus those who somewhat adhered ($M=1.2$, $SD=2.0$, $P=.04$); digestive issues ($M=2.4$, $SD=2.4$) versus those who did not/minimally adhered ($M=.7$, $SD=2.2$, $P=.02$); and concentration difficulties ($M=1.9$, $SD=2.1$) versus those who did not/minimally adhered ($M=.6$, $SD=2.2$, $P=.001$) (Table 5). Participants who somewhat adhered to the diet also had greater improvement in concentration difficulties ($M=1.6$, $SD=1.7$) versus those who did not/minimally adhere ($P=.007$).

DISCUSSION

Standard American Diet has been shown to be a contributor to many common chronic diseases.^{1,2,4,18} Although controversy exists around which foods may be detrimental to health, consuming a diet that is nutrient dense reduces all-cause mortality.¹⁹ In this health care improvement project evaluation of a physician-guided, 28-day Health Reset dietary

TABLE 4. ANOVA Effect Sizes by Health Reset Dietary Challenge Year^a

Dependent Variable	η^2	95% Confidence Interval	
		Lower	Upper
2021			
Change in energy level	.090	.019	.175
Change in aches/pains ^b	.019	.000	.070
Change in sleep difficulties ^b	.016	.000	.064
Change in digestive issues ^b	.060	.004	.138
Change in concentration difficulties ^b	.008	.000	.046
2022			
Change in energy level	.117	.039	.201
Change in aches/pains ^b	.074	.014	.149
Change in sleep difficulties ^b	.034	.000	.094
Change in digestive issues ^b	.043	.001	.106
Change in concentration difficulties ^b	.066	.010	.139
2023			
Change in energy level	.110	.028	.202
Change in aches/pains ^b	.018	.000	.071
Change in sleep difficulties ^b	.046	.000	.118
Change in digestive issues ^b	.055	.002	.132
Change in concentration difficulties ^b	.080	.012	.165

^aAbbreviation: η^2 =Eta-squared
^bReverse-coded.

challenge—removing dairy products, gluten-containing foods, and sugar—offered yearly from 2021 to 2023 to health system employee participants, we found significantly improved mean ranked scores for self-reported energy levels, aches/pains, sleep difficulties, digestive issues, and difficulty concentrating between predietary and postdietary challenge surveys. Furthermore, changes in all items measured were statistically significant when comparing adherence levels in at least 1 project year. Participants who most closely adhered to the diet had significantly higher improvements in self-reported energy levels and digestive issues in all project years. This suggests that those who most closely adhered to the diet restrictions may have experienced the most perceived benefit in these 2 areas at the end of the challenge.

The detrimental effects of sugar are understood. A hallmark of the Western diet, high

sugar intake is well recognized as a risk factor for obesity, cardiovascular disease, metabolic syndrome, and type 2 diabetes. Excessive intake of dietary sugars can upregulate the production of pro-inflammatory cytokines and lead to chronic inflammation.¹³ The consumption of sugar sweetened beverages has significantly contributed to the burden of cardiometabolic disease as the largest source of added sugar in the SAD, although its use is declining in some countries, including the United States, because of awareness campaigns and taxation.²⁰ Although micronutrients are bioavailable in 100% fruit juice, it is increasingly discouraged by health agencies because of its high glycemic load and a higher all-cause mortality risk associated with each serving of fruit juice.²¹ Whole fruits contain numerous beneficial phytonutrients, less juice per serving, and fiber and are considered high quality food options.^{22,23}

Although the literature is sparse relative to gluten's association with chronic disease and inflammation and this is currently a topic of debate,²⁴⁻²⁶ some patients without celiac disease who have gastrointestinal or extraintestinal symptoms can find improvement when they eradicate gluten from their diets.²⁷ Conditions associated with this so-called non-celiac gluten sensitivity include rheumatoid, osteoarthritis, autism spectrum disorder, endometriosis, nonspecific joint pain, fibromyalgia, fatigue, and autoimmunity.^{14,28-32}

Dairy products (eg, cow, sheep, goat, and other mammal milk) have also been associated with irritable bowel syndrome and constipation,³³⁻³⁶ rashes, joint inflammation,³⁷ and respiratory or allergic symptoms³⁸ in susceptible individuals. Such symptoms appear to be mediated by lactose or casein (possibly primarily from A1 protein).³⁹ Despite the paucity of evidence for dairy as a cause of chronic symptoms, integrative medicine clinicians may recommend trials of dairy abstinence. Integrative clinicians commonly find that patients who shift from the SAD to some form of an anti-inflammatory diet typically note improvements in their well-being, an observation that is supported by peer reviewed literature studying the effects of an anti-inflammatory diet for common conditions.^{9,40,41}

As adherence to dietary recommendations is a critical factor for preventing and managing

TABLE 5. Tukey HSD Post Hoc Tests by Health Reset Dietary Challenge Year^a

Dependent Variable	(I) Adherence	(J) Adherence	Mean Difference (I-J)	SE	P	95% Confidence Interval	
						Lower Bound	Upper Bound
2021							
Change in energy level	Did not/minimally	Somewhat	-.5	.48	.56	-1.64	.65
		Mostly/completely	-1.42	.46	.007 ^b	-2.52	-.33
	Somewhat	Did not/minimally	.5	.48	.56	-.65	1.64
		Mostly/completely	-.93	.29	.004 ^b	-1.61	-.25
Mostly/completely	Did not/minimally	-1.42	.46	.007 ^b	.33	2.52	
	Somewhat	-.93	.29	.004 ^b	.25	1.61	
Change in aches/pains ^c	Did not/minimally	Somewhat	.47	.6	.71	-.95	1.89
		Mostly/completely	-.15	.57	.96	-1.51	1.21
	Somewhat	Did not/minimally	-.47	.6	.71	-1.89	.95
		Mostly/completely	-.62	.36	.19	-1.47	.22
Mostly/completely	Did not/minimally	.15	.57	.96	-1.21	1.51	
	Somewhat	.62	.36	.19	-.22	1.47	
Change in sleep difficulties ^c	Did not/minimally	Somewhat	.66	.65	.57	-.88	2.2
		Mostly/completely	.9	.62	.99	-1.39	1.57
	Somewhat	Did not/minimally	-.66	.65	.57	-2.2	.88
		Mostly/completely	-.57	.38	.29	-1.47	.33
Mostly/completely	Did not/minimally	-.09	.62	.99	-1.57	1.39	
	Somewhat	.57	.38	.29	-.33	1.47	
Change in digestive issues ^c	Did not/minimally	Somewhat	.09	.64	.99	-1.43	1.60
		Mostly/completely	-1.04	.61	.21	-2.48	.41
	Somewhat	Did not/minimally	-.09	.64	.99	-1.60	1.43
		Mostly/completely	-1.12	.38	.01 ^b	-2.02	-.22
Mostly/completely	Did not/minimally	1.04	.61	.21	-.41	2.48	
	Somewhat	-1.12	.38	.01 ^b	.22	2.02	
Change in concentration difficulties ^c	Did not/minimally	Somewhat	-.10	.54	.98	-1.37	1.16
		Mostly/completely	-.41	.51	.71	-1.63	.81
	Somewhat	Did not/minimally	.10	.54	.98	-1.16	1.37
		Mostly/completely	-.31	.32	.60	-1.06	.45
Mostly/completely	Did not/minimally	.41	.51	.71	-.81	1.63	
	Somewhat	.31	.32	.60	-.45	1.06	
2022							
Change in energy level	Did not/minimally	Somewhat	-.24	.38	.81	-1.14	.67
		Mostly/completely	-1.30	.38	.002 ^b	-2.20	-.41
	Somewhat	Did not/minimally	.24	.38	.81	-.67	1.14
		Mostly/completely	-1.06	.24	<.001 ^b	-1.64	-.49
Mostly/completely	Did not/minimally	-1.30	.38	.002 ^b	.41	2.20	
	Somewhat	-1.06	.24	<.001 ^b	.49	1.64	
Change in aches/pains ^c	Did not/minimally	Somewhat	-.73	.49	.30	-1.89	.43
		Mostly/completely	-1.61	.49	.003 ^b	-2.76	-.46
	Somewhat	Did not/minimally	.73	.49	.30	-.43	1.89
		Mostly/completely	-.88	.31	.01 ^b	-1.61	-.14
Mostly/completely	Did not/minimally	-1.61	.49	.003 ^b	.46	2.76	
	Somewhat	-.88	.31	.01 ^b	.14	1.61	
Change in sleep difficulties ^c	Did not/minimally	Somewhat	-.11	.54	.98	-1.38	1.15
		Mostly/completely	-.90	.53	.21	-2.15	.35
	Somewhat	Did not/minimally	.11	.54	.98	-1.15	1.38
		Mostly/completely	-.79	.34	.06	-1.59	.02
Mostly/completely	Did not/minimally	.90	.53	.21	-.35	2.15	
	Somewhat	.79	.34	.06	-.02	1.59	

Continued on next page

TABLE 5. Continued

Dependent Variable	(I) Adherence	(J) Adherence	Mean Difference (I-J)	SE	P	95% Confidence Interval	
						Lower Bound	Upper Bound
Change in digestive issues ^c	Did not/minimally	Somewhat	-.62	.61	.57	-2.05	.82
		Mostly/completely	-1.43	.60	.047 ^b	-2.84	-.02
	Somewhat	Did not/minimally	.62	.61	.57	-.82	2.05
		Mostly/completely	-.81	.38	.08	-1.71	.08
	Mostly/completely	Did not/minimally	-1.43	.60	.047 ^b	.02	2.84
		Somewhat	.81	.38	.08	-.08	1.71
Change in concentration difficulties ^c	Did not/minimally	Somewhat	-.94	.54	.20	-2.22	.34
		Mostly/completely	-1.75	.54	.004 ^b	-3.02	-.49
	Somewhat	Did not/minimally	.94	.54	.20	-.34	2.22
		Mostly/completely	-.81	.35	.05	-1.63	.00
	Mostly/completely	Did not/minimally	-1.75	.54	.004 ^b	.49	3.02
		Somewhat	.81	.35	.05	.00	1.63
2023							
Change in energy level	Did not/minimally	Somewhat	-.41	.39	.56	-1.34	.53
		Mostly/completely	-1.38	.41	.002 ^b	-2.35	-.42
	Somewhat	Did not/minimally	.41	.39	.56	-.53	1.34
		Mostly/completely	-.98	.26	<.001 ^b	-1.60	-.36
	Mostly/completely	Did not/minimally	-1.38	.41	.002 ^b	.42	2.35
		Somewhat	-.98	.26	<.001 ^b	.36	1.60
Change in aches/pains ^c	Did not/minimally	Somewhat	-.48	.51	.61	-1.69	.73
		Mostly/completely	-.83	.53	.26	-2.08	.42
	Somewhat	Did not/minimally	.48	.51	.61	-.73	1.69
		Mostly/completely	-.35	.34	.56	-1.16	.46
	Mostly/completely	Did not/minimally	.83	.53	.26	-.42	2.08
		Somewhat	.35	.34	.56	-.46	1.16
Change in sleep difficulties ^c	Did not/minimally	Somewhat	-.16	.52	.95	-1.40	1.08
		Mostly/completely	-1.02	.54	.15	-2.30	.26
	Somewhat	Did not/minimally	.16	.52	.95	-1.08	1.40
		Mostly/completely	-.86	.35	.04 ^b	-1.69	-.03
	Mostly/completely	Did not/minimally	1.02	.54	.15	-0.26	2.30
		Somewhat	-.86	.35	.04 ^b	.03	1.69
Change in digestive issues ^c	Did not/minimally	Somewhat	-.80	.60	.39	-2.22	.63
		Mostly/completely	-1.67	.62	.02 ^b	-3.14	-.19
	Somewhat	Did not/minimally	.80	.60	.39	-.63	2.22
		Mostly/completely	-.87	.40	.08	-1.82	.09
	Mostly/completely	Did not/minimally	-1.67	.62	.02 ^b	.19	3.14
		Somewhat	.87	.40	.08	-.09	1.82
Change in concentration difficulties ^c	Did not/minimally	Somewhat	-1.53	.50	.007 ^b	-2.71	-.36
		Mostly/completely	-1.84	.51	.001 ^b	-3.05	-.62
	Somewhat	Did not/minimally	-1.53	.50	.007 ^b	.36	2.71
		Mostly/completely	-.30	.33	.63	-1.09	.48
	Mostly/completely	Did not/minimally	-1.84	.51	.001 ^b	.62	3.05
		Somewhat	.30	.33	.63	-.48	1.09

^aAbbreviation: HSD, honestly significant difference; SE, standard error.

^bSignificant difference at $P < .05$.

^cReverse coded.

chronic diseases, it is important to identify and address barriers to adherence.^{42,43} The productivity losses from chronic disease among employees are substantial;⁴⁴ workplace health promotion programs can favorably deliver on employee health and well-being and may be particularly appealing for self-insured companies.⁴⁵⁻⁴⁷

Limitations

The Health Reset challenge was voluntary; it is possible that more engaged employees already planning to modify their lifestyles were self-selected. Some employees may also not have been aware of the Health Reset challenge if they did not read the weekly digest email that mentioned the challenge or were not active in the employment wellness program at the time of each annual challenge. The non-completion rate was high in each challenge year, ranging from 41% to 56%. The low participation numbers as a percentage of the employee population may be related to the highly challenging nature of the initiative. Future research could examine methods to increase participation, decrease attrition, and increase dietary challenge adherence, including follow-up with those who dropped out of similar challenges to understand barriers to completing the challenge. We also lacked evidence to support findings that partial dietary restriction adherence improved some health outcomes, which is another area for future research. Moreover, we lacked data on the number of celiac or estimated gluten sensitive nonceliac challenge participants.

We also lacked respondents' baseline health and body composition data, and we did not assess baseline dietary patterns, total calories or amount and types of fat consumed, fruit or vegetable intake, level of physical activity, frequency of eating out or eating fast foods, or other factors or lifestyle changes that may influence overall diet and health. Future research could assess the impacts of these factors on similar dietary challenge outcomes. It is worth noting that foods marketed as sugar-free, dairy-free, or gluten-free are not necessarily wholesome products; and in fact, some are highly processed and low in fiber. Participants were encouraged to consume a whole foods diet high in plants in the challenge guide and during the weekly question

and answer sessions. Though we recommended avoiding processed foods, we did not inquire about this in the post-challenge questions. We acknowledge that removing whole grains from the diets of patients who do not react unfavorably to them could have detrimental effects if the replacement foods are refined or the eradication is unnecessarily prolonged.

There was no control group or matched cohort, all responses were self-reported, and there was no assessment beyond the dietary challenge period. We also did not track which foods (sugar, dairy, or gluten) seemed to trigger symptoms when participants systematically reintroduced them, so these results reflect abstinence from all 3 foods together to the degree that participants adhered to the challenge guidelines. We were unable to assess whether positive outcomes were due to dietary changes or possibly reduced caloric intake. Finally, gastrointestinal symptoms can be wide-ranging, and the challenge questionnaires did not require participants to specify their symptoms, which makes understanding the effects of the Health Reset in this area more difficult. To mitigate some limitations of studying this initiative, we did control for the self-reported level of adherence to the dietary challenge in each of the 3 health care improvement project years.

CONCLUSION

Essentia Health's Health Reset health care improvement project appeared to improve self-reported outcomes, increase engagement with employees, and has the potential to reduce long-term health care costs if the diet is maintained to keep symptoms under control. Energy levels and digestive symptoms improved consistently with greater adherence to the challenge, suggesting improved vitality from a relatively simple initiative outside of clinical care. Suggested next steps include formal research, which could validate this instrument, confirm our findings in other populations and in randomized control trials, and explore the benefits of voluntary health challenges to groups of employees and patients in general.

POTENTIAL COMPETING INTERESTS

The authors report no competing interests.

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SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at <http://www.mcpiqjournal.org>. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

Abbreviations and Acronyms: HSD, honestly significant difference; M, mean; SAD, standard American diet; SD, standard deviation

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