



Sources of well-being and cardiovascular health: A mixed methods investigation from the MIDUS study[☆]

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ABSTRACT

Objective: Using mixed methods, we investigated whether different sources of well-being were associated with better cardiovascular health.

Methods: Data came from adults (55% women; 19% Black, 75% White) with biomarker data from the Midlife in the United States (MIDUS) Study. At the second wave and in a refresher cohort, participants answered the question "What do you do to make your life go well?" Judges evaluated each response for the presence of 12 sources of well-being (e.g., positive relationships, faith, health maintenance). Participants were also assessed on 8 components of cardiovascular health at two waves, an average of 12 years apart. Concurrent ($N = 2036$) and longitudinal ($N = 650$) linear regressions examined the association between each well-being source in unadjusted models and models adjusted for sociodemographic factors and word count.

Results: Adults who wrote about positive relationships, positive attitudes, enjoyment, coping, health maintenance, and planning tended to have better cardiovascular health in unadjusted models concurrently and longitudinally. In fully adjusted models, health maintenance ($p < .001$) and planning and organization ($p = .004$) were associated with better cardiovascular health concurrently. Additionally, health maintenance ($p = .03$) and work ($p = .04$) were associated with better cardiovascular health longitudinally.

Conclusions: Individuals who endorsed maintaining their health as central to well-being showed healthier cardiovascular outcomes 12 years later. Combining qualitative assessments of sources of well-being with clinically assessed measures of cardiovascular health highlights unique contributors of well-being that are relevant for health and may not be evident with conventional self-report measures.

1. Introduction

Ideal health reflects more than the absence of disease. Assessing the presence of healthy behaviors and biological functioning in the population provides insight into factors that support the maintenance and promotion of health across the life course. The American Heart Association (AHA) has long been focused on reducing risk of cardiovascular disease (CVD) and associated deaths, which is critically important given that CVD is the leading cause of death in the United States and around

the world (Kochanek et al., 2023; OECD, 2023). However, in 2010, the AHA made a fundamental shift to expand their focus to health promotion via healthy behavioral and biological functioning (Lloyd-Jones et al., 2010). Central to this was the development of cardiovascular health (CVH), also known as Life's Essential 8, which is defined by four health behaviors (healthy diet, engagement in physical activity, no nicotine use, and adequate amounts of sleep) and four biological factors (healthy levels of blood pressure, total cholesterol, glucose, and body mass index [BMI]) (Lloyd-Jones et al., 2022a). Although the prevalence

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of CVH is relatively low, it is a powerful predictor of future health and can indicate risk before disease becomes apparent (Lloyd-Jones et al., 2022a; Tsao et al., 2023). For example, having ideal status on all eight components of CVH is related to reduced risk of all-cause mortality, cardiovascular mortality, and CVD (Fang et al., 2016; Sun et al., 2023). One study estimated that if all adults in the U.S. had ideal CVH, then two million cardiovascular events would be prevented each year (Bundy et al., 2021). There is growing recognition that psychosocial factors are linked with CVH (Levine et al., 2021; Lloyd-Jones et al., 2022a). Specifically, psychological well-being – or the positive thoughts and feelings that individuals use to evaluate their lives (Boehm and Kubzansky, 2012) – is associated with many salubrious outcomes relevant for CVD (Boehm, 2021; Boehm and Kubzansky, 2012; Kubzansky et al., 2018). In the current study, we examined whether self-identified sources of well-being, assessed from open-ended text responses, were concurrently and longitudinally associated with CVH.

A growing number of studies report associations between psychological well-being (e.g., positive emotions, life satisfaction, purpose in life, optimism) and better cardiovascular outcomes, including reduced likelihood of CVD, lower risk of secondary cardiovascular events among those with CVD, and lower risk of cardiovascular mortality (Alimujiang et al., 2019; Cohen et al., 2015; DuBois et al., 2015; Rozanski et al., 2019). Various markers of psychological well-being have also been linked with better overall CVH (Boehm et al., 2020; Boehm et al., 2020; Boehm et al., 2017; Hernandez et al., 2015, 2018; Park et al., 2021; Santos et al., 2024; Sims et al., 2019). In addition, higher levels of psychological well-being are associated with the individual behavioral components of CVH, including reduced likelihood of smoking (Boehm et al., 2018a; Kelloniemi et al., 2005; Konkoly Thege et al., 2009), more physical activity (Baruth et al., 2011; Boehm et al., 2018a; Kim et al., 2017), better sleep quantity and quality (Lacruz et al., 2016; Lemola et al., 2013; Ong et al., 2013; Phelan et al., 2010), and a healthier diet (Ait-Hadad et al., 2020; Boehm et al., 2018b; Grant et al., 2009). Psychological well-being has also been linked to healthier levels of the biological factors of blood pressure, lipids, BMI, and glucose (Boylan et al., 2017; Linna et al., 2013; Qureshi et al., 2022b; Trudel-Fitzgerald et al., 2014).

Notably, much of the literature on psychological well-being and CVH relies on cross-sectional data, and more research with prospective, longitudinal study designs and objectively assessed CVH is needed (Kubzansky et al., 2018). Further, most research investigating associations between psychological well-being and CVH uses self-reported scales to measure well-being. Self-report measures capture “how much” well-being individuals have but do not provide insights into how people think about and pursue well-being in their own lives. Such assessments may be more easily derived via qualitative approaches that allow individuals to describe their own sense of well-being. Past work suggests the language people use reflects their thoughts, feelings, interests, and priorities (Boyd and Schwartz, 2021; Tausczik and Pennebaker, 2010; Vine et al., 2020). Additionally, well-being assessed via text coding (i.e., based on language used in children’s essays or positive emotions in older adults’ autobiographies) is associated with cardiometabolic functioning and longevity (Boehm et al., 2022; Danner et al., 2001; Pressman and Cohen, 2012). However, there is a paucity of qualitative data in the literature on well-being and health, which limits understanding about how positive feelings and functioning operate in whole lives and in ways that matter for CVH (Willen et al., 2022).

The current study examines concurrent and prospective longitudinal associations between psychological well-being and CVH using data from the Midlife in the United States (MIDUS) Study, a national longitudinal study of aging. Although the MIDUS survey included self-reported scales of psychological well-being and positive psychological functioning, MIDUS respondents also answered the open-ended question, “What do you do to make your life go well?” We use these rich qualitative responses to assess sources of well-being in the current study. Initial examination of the open-ended responses identified 12 major sources of

well-being that were concordant with self-report psychological well-being scales (Boylan et al., 2024). The sources listed in order by frequency of endorsement for more than 2000 participants included positive relationships, positive attitude, faith, self-awareness, work, coping, health maintenance, enjoyment, planning and organization, learning, integrity, and personal finances. Building from work demonstrating the sources of well-being were reliably and validly assessed (Boylan et al., 2024), the present investigation examined whether each source of well-being was associated with overall CVH both concurrently and an average of 12 years later. This mixed-methods approach offers insight into which sources of well-being are most strongly associated with CVH.

2. Methods

2.1. Participants

Data came from the MIDUS Study, a national study of U.S. adults (Radler, 2014). The first wave was initiated in 1995–1996 for the core sample (MIDUS I). Follow-up assessments occurred in 2004–2005 (MIDUS II) and 2013–2014 (MIDUS III) (Song et al., 2021). Individuals who participated in all three waves were more likely to be women, be married, have higher levels of education, and be healthier compared with individuals who dropped out (Song et al., 2021). Various cohorts of participants have been added to the MIDUS Study since its inception. A cohort of Black participants ($n = 592$) from Milwaukee, WI was added at MIDUS II and re-assessed at MIDUS III. A refresher cohort matching the age and gender distribution of participants at MIDUS I was added in 2011–2014, along with a second cohort of Black individuals from Milwaukee. A subsample of the core participants ($n = 1054$), Milwaukee participants ($n = 201$), refresher participants ($n = 746$), and Milwaukee refresher participants ($n = 117$) underwent overnight biomarker assessments at one of three clinical research centers during the MIDUS II (2004–2008) or refresher cohort (2013–2015) data collection. MIDUS Study procedures were approved by Institutional Review Boards at the University of Wisconsin, Madison and all participants provided written informed consent.

The sample for the current research was based on participants who engaged in the first biomarker assessment as this was when the primary variables of interest were assessed (for more details, see Boylan et al., 2020; Love et al., 2010). Of the 2118 participants eligible for the analytic sample for concurrent analyses, 71 participants were missing data on MIDUS II CVH, 8 additional participants were missing data on race, and 3 additional participants were missing data on education. This resulted in 2036 participants for concurrent analyses. For prospective longitudinal analyses, 747 participants completed the MIDUS III biomarker assessment of whom 687 also had data from the MIDUS II biomarker assessment. Of those 687, 21 participants were missing data on MIDUS II CVH, an additional 14 participants were missing data on MIDUS III CVH, and 2 participants were missing data on race or education. This yielded 650 participants for prospective longitudinal analyses.

2.2. Sources of well-being

At the end of the self-administered questionnaire administered during the biomarker assessment, participants were asked to write a response to the question: “What do you do to make your life go well?” On average, MIDUS II and refresher participants wrote 60.03 words (median = 45.00; $SD = 55.79$; minimum = 1; maximum = 457). In previous work (Boylan et al., 2024), directed content analysis was used to derive a theoretically based codebook (Hsieh and Shannon, 2005). This involved developing an initial codebook from Markus and colleagues (2004) and then using theoretical knowledge and an iterative process to refine themes based on randomly selected written responses. Using both deductive and inductive strategies yielded a rigorous codebook to evaluate 12 themes or sources of well-being (Bingham and

Witkowski, 2021; Daly, 2007; Hsieh and Shannon, 2005): positive relationships, positive attitude, faith, self-awareness, work, coping, health maintenance, enjoyment, planning and organization, learning, integrity, and personal finances (see Supplemental Table S1 for definitions and illustrative phrases from participants' responses). Nested within most themes were more specific subthemes (e.g., subthemes of positive emotions, optimism, satisfaction, and others within the positive attitude theme), although analyses at the subtheme level were not conducted in the current research.

As described in detail elsewhere (Boylan et al., 2024), each sentence within a response was evaluated for relevant themes. Sentences were coded with as many themes as necessary to fully capture the content within each sentence. Three individuals independently coded each response. Disagreements among coders were not discussed. Instead, when at least two of the three individuals indicated that a theme was present, then that theme was considered endorsed by the MIDUS participant (1) versus absent (0) (O'Connor and Joffe, 2020). As reported previously (Boylan et al., 2024), mean percent agreement among coders for each theme was strong ($M = .91$; minimum = .80; maximum = .98). On average, participants wrote responses with 4.43 themes ($SD = 2.25$; minimum = 0; maximum = 12). Each theme and the total number of themes (standardized with $M = 0$ and $SD = 1$) served as predictors.

2.3. Cardiovascular health

CVH was defined following updated guidelines from the AHA and its Essential Eight composite (Lloyd-Jones et al., 2022a). It includes eight components: diet, physical activity, nicotine exposure, sleep, BMI, lipids, glycosylated hemoglobin (HbA1c), and blood pressure. Each component was assessed during the biomarker data collection (see Supplemental Material for more details). Consistent with Lloyd-Jones and colleagues (2022a), participants received points ranging from 0 to 100 on each of the eight components. The unweighted average of the eight components was then calculated to represent overall CVH with higher numbers indicating better health. The range of CVH scores for concurrent analyses was 14.38–100.00 points ($M = 68.72$; median = 70.00; $SD = 14.01$). The range of CVH scores for longitudinal analyses was 25.00–100.00 points ($M = 69.62$; median = 70.63; $SD = 13.32$). These are comparable to or slightly better than estimates of overall CVH from adults over age 40 in the National Health and Nutrition Examination Surveys from 2013 through 2018 (Lloyd-Jones et al., 2022b).

2.4. Covariates

Covariates were selected based on evidence suggesting both the themes in qualitative responses and CVH are patterned by sociodemographic characteristics (Boylan et al., 2024; Markus et al., 2004; Qureshi et al., 2022a). This included age at clinic visit (years), gender (men [reference] and women), highest level of education completed (high school diploma or less, some college, and bachelor's degree or higher [reference]), and race (White [reference], Black, and other). Following previous research (Boehm et al., 2022, 2024), we also included the word count of the open-ended responses as a covariate because the length of the responses could affect which and how many sources of well-being were noted. Word count may also vary based on sociodemographic background and act as a confounder in the association between well-being themes and CVH. Continuous variables were mean centered based on the analytic sample.

2.5. Statistical analyses

The distributions of each source of well-being, CVH, and covariates were examined first, followed by linear regression models examining each covariate's association with CVH. Primary linear regression models examined the association between the presence of each source of well-

being at MIDUS II/MIDUS Refresher and overall CVH at MIDUS II/MIDUS Refresher (concurrent analyses) and MIDUS III (longitudinal analyses). Three sequentially adjusted models were examined: the first was unadjusted for covariates, the second adjusted for sociodemographic covariates (age, gender, education, and race), and the third additionally adjusted for word count. In longitudinal analyses with MIDUS III CVH as the outcome, a fourth model additionally adjusted for MIDUS II CVH for prospective analyses. In secondary analyses, we also considered whether the total number of themes endorsed was associated with CVH concurrently and longitudinally. These analyses tested whether identifying more (vs. fewer) well-being themes was also associated with CVH, independent of the topic of well-being, and is aligned with calls to consider multiple dimensions of well-being simultaneously in relation to health (Kubzansky et al., 2018). Analyses were conducted in SPSS version 29 with $\alpha = .05$, two-tailed.

Given that the endorsement of well-being sources varied by sociodemographic factors (Boylan et al., 2024), exploratory analyses examined whether associations between well-being sources and CVH were differently associated in certain sociodemographic subgroups. Interaction terms representing the product of each well-being source and age (continuous, mean-centered), gender, education, and race, respectively, were created and added to a linear regression model that contained the well-being source and all sociodemographic factors. $\alpha = .01$ for these exploratory analyses.

3. Results

3.1. Participant characteristics

The 2036 participants in the concurrent analytic sample were on average 55.48 years old (median = 55.00; $SD = 12.60$; minimum = 26; maximum = 86) at the MIDUS II and refresher biomarker assessments. Slightly more than half were women ($n = 1115$; 54.8%) and the majority were White ($n = 1530$; 75.1%) followed by Black ($n = 380$; 18.7%) and other races/ethnicities ($n = 126$; 6.2%). Nearly half of participants had a bachelor's degree or higher ($n = 977$; 46.1%); the rest had some college education ($n = 638$; 30.1%) or a high school diploma or less ($n = 499$; 23.6%). Participants endorsed positive relationships (72%), faith (40.2%), and positive attitudes (41.5%) most frequently of all sources of well-being (Supplemental Table S1).

Each covariate's association with concurrent CVH was examined in a linear regression model with all covariates. Most were associated with CVH ($ps \leq .002$). Younger adults ($B(SE) = -.13(.02)$), women ($B(SE) = 2.83(.58)$), and those who wrote more words ($B(SE) = .02(.01)$) had better CVH. Black participants ($B(SE) = -9.12(.78)$) and those with a high school diploma ($B(SE) = -8.09(.75)$) or some college ($B(SE) = -5.09(.67)$) had worse CVH. Being a race besides White or Black was not associated with CVH ($B(SE) = -.92(1.19)$, $p = .44$). The pattern of associations was very similar when considering CVH longitudinally, although older adults had better CVH ($B(SE) = .15(.05)$, $p = .002$) and word count was no longer significantly associated with CVH ($B(SE) = .01(.01)$, $p = .23$).

3.2. Concurrent associations between sources of well-being and cardiovascular health

The endorsement of most well-being themes was significantly associated with better concurrent CVH in unadjusted analyses (Table 1). This included positive relationships, integrity, self-awareness, positive attitude, enjoyment, coping, health maintenance, learning, work, personal finances, and planning. When accounting for age, gender, race, and education, significant associations for enjoyment, health maintenance, and planning persisted. However, after additionally adjusting for word count, only two sources of well-being remained associated with higher CVH scores: health maintenance and planning. This suggests individuals who described prioritizing behaviors to support their health or making

Table 1

Concurrent analyses for the association between sources of well-being and cardiovascular health at MIDUS II (N = 2036).

	ES	Model 1				Model 2				Model 3			
		B	LL	UL	p	B	LL	UL	p	B	LL	UL	p
Sources of Well-Being													
Positive Relationships	.20	2.78	1.43	4.13	<.001	1.07	−.19	2.33	.10	.64	−.65	1.94	.33
Faith	.002	.02	−1.22	1.26	.97	.54	−.61	1.69	.36	.36	−.79	1.51	.54
Integrity	.13	1.77	.06	3.48	.04	.62	−.95	2.19	.44	.25	−1.34	1.83	.76
Self-Awareness	.17	2.37	1.11	3.64	<.001	.03	−1.14	1.21	.96	−.55	−1.78	.67	.38
Positive Attitude	.19	2.61	1.38	3.84	<.001	.73	−.41	1.88	.21	.29	−.89	1.47	.63
Enjoyment	.22	3.09	1.73	4.45	<.001	1.44	.17	2.71	.03	1.09	−.20	2.38	.10
Coping	.12	1.67	.36	2.99	.01	−.40	−1.61	.82	.52	−.94	−2.19	.31	.14
Health Maintenance	.48	6.60	5.30	7.89	<.001	4.94	3.73	6.15	<.001	4.74	3.51	5.98	<.001
Learning	.24	3.33	1.66	4.99	<.001	.85	−.70	2.41	.28	.27	−1.33	1.87	.74
Work	.19	2.61	1.33	3.90	<.001	.42	−.78	1.61	.49	.02	−1.21	1.24	.98
Personal Finances	.22	3.07	1.01	5.14	.004	1.89	−.006	3.78	.051	1.39	−.53	3.31	.16
Planning and Organization	.34	4.76	3.14	6.38	<.001	2.59	1.09	4.09	<.001	2.22	.69	3.75	.004
Total Sources of Well-Being	.22	3.07	2.47	3.66	<.001	1.39	0.80	1.97	<.001	1.25	0.55	1.96	<.001

Note. Model 1 was unadjusted. Model 2 adjusted for sociodemographic characteristics (age, gender, education, and race). Model 3 additionally adjusted for word count. ES = effect size (d for the sources of well-being and r for the total sources of well-being); LL = lower limit for 95% confidence interval; UL = upper limit for 95% confidence interval. Each source of well-being was entered in a separate regression model. Bold font represents $p < .05$.

plans as sources of their well-being tended to display better CVH concurrently. Indeed, individuals who did not endorse health maintenance had lower CVH scores ($M = 66.73$; $SD = 14.06$) relative to those who did endorse health maintenance ($M = 73.32$; $SD = 12.79$), Cohen's $d = .48$. A similar pattern was evident for individuals who did not endorse planning and organization ($M = 67.93$; $SD = 13.88$) compared with those who did ($M = 72.69$; $SD = 14.01$), Cohen's $d = .34$.

Secondary analyses showed that individuals who identified more sources of well-being had better concurrent CVH, regardless of covariate adjustment (Table 1; fully adjusted: $b = 1.25$; 95% confidence interval = 0.55, 1.96; $p < .001$).

3.3. Longitudinal associations between sources of well-being and cardiovascular health

The mean number of years between biomarker assessments during the second and third waves of data collection was 11.60 years ($SD = 1.25$; minimum = 8.00; maximum = 17.00). Longitudinal analyses investigating the association between sources of well-being at MIDUS II and MIDUS III CVH paralleled concurrent findings (Table 2). In unadjusted models, endorsing the themes of positive relationships, positive attitude, enjoyment, coping, health maintenance, learning, work, personal finances, and planning were each related to better CVH. After adjusting for age, gender, race, and education, associations were

maintained for positive relationships, health maintenance, and work. However, only the themes of health maintenance and work were associated with CVH approximately 12 years later when additionally adjusting for response word count. Moreover, when MIDUS II CVH was considered, only the theme of coping was predictive of MIDUS III CVH ($b = 1.94$; 95% confidence interval = 0.19, 3.69; $p = .03$). To put this in perspective, individuals who wrote about coping as a source of their well-being showed higher CVH scores ($M = 72.00$; $SD = 12.99$) than individuals who did not ($M = 68.50$; $SD = 13.34$), Cohen's $d = .27$. No other sources of well-being were prospectively associated with CVH.

Similar to concurrent associations, those who included more well-being themes in their responses had better CVH at MIDUS III in unadjusted and fully adjusted models (Table 2; fully adjusted: $b = 1.63$; 95% confidence interval = 0.42, 2.84; $p = .008$). However, findings were attenuated when additionally adjusting for MIDUS II CVH ($b = .68$; 95% confidence interval = −0.36, 1.73; $p = .20$).

3.4. Exploratory analyses: moderation by sociodemographic characteristics

Exploratory models tested whether associations between sources of well-being and CVH differed among sociodemographic subgroups (i.e., by age, gender, education, and race). In cross-sectional and longitudinal models (results not presented), nearly all interaction terms between

Table 2

Longitudinal analyses for the association between sources of well-being and cardiovascular health at MIDUS III (N = 650).

	ES	Model 1				Model 2				Model 3			
		B	LL	UL	p	B	LL	UL	p	B	LL	UL	p
Sources of Well-Being													
Positive Relationships	.27	3.52	1.23	5.81	.003	0.98	−1.12	3.08	.36	.75	−1.40	2.90	.50
Faith	.12	1.55	−.53	3.63	.14	1.66	−.21	3.54	.08	1.56	−.32	3.45	.10
Integrity	.04	−.50	−3.26	2.26	.72	−.60	−3.11	1.90	.64	−.88	−3.41	1.66	.50
Self-Awareness	.14	1.88	−.23	4.00	.08	.19	−1.74	2.12	.84	−.17	−2.18	1.85	.87
Positive Attitude	.20	2.62	.54	4.71	.01	.36	−1.56	2.28	.71	.09	−1.89	2.06	.93
Enjoyment	.28	3.68	1.37	5.99	.002	1.59	−.53	3.70	.14	1.38	−.79	3.54	.21
Coping	.27	3.50	1.32	5.68	.002	1.66	−.35	3.68	.11	1.50	−.55	3.54	.15
Health Maintenance	.32	4.16	1.93	6.38	<.001	2.31	.28	4.35	.03	2.24	.20	4.27	.03
Learning	.22	2.94	.05	5.84	.05	−.65	−3.33	2.04	.64	−1.18	−3.97	1.61	.41
Work	.32	4.17	2.06	6.28	<.001	2.31	0.38	4.24	.02	2.14	.15	4.14	.04
Personal Finances	.27	3.65	.03	7.26	.05	1.56	−1.72	4.85	.35	1.26	−2.08	4.59	.46
Planning and Organization	.22	2.94	.25	5.63	.03	1.13	−1.32	3.58	.37	.86	−1.64	3.37	.50
Total Sources of Well-Being	.25	3.47	2.43	4.50	<.001	1.49	0.48	2.51	.004	1.63	0.42	2.84	.008

Note. Model 1 was unadjusted. Model 2 adjusted for sociodemographic characteristics (age, gender, education, and race). Model 3 additionally adjusted for word count. ES = effect size (d for the sources of well-being and r for the total sources of well-being); LL = lower limit for 95% confidence interval; UL = upper limit for 95% confidence interval. Each source of well-being was entered in a separate regression model. Bold font represents $p < .05$.

sources of well-being and age, gender, education, and race, respectively, were not significantly different from zero. The one exception was that self-awareness interacted significantly with gender ($p = .003$) such that women who endorsed self-awareness had better CVH at MIDUS III whereas men who endorsed self-awareness had worse CVH at MIDUS III.

4. Discussion

The primary objective of this study was to examine associations between self-identified sources of well-being and CVH, assessed via the AHA's Life's Essential Eight composite (Lloyd-Jones et al., 2022a). In concurrent analyses that controlled for sociodemographic characteristics and word count, individuals who identified maintaining their health and planning as things they did to make their life go well had better CVH compared to those who did not mention these themes. In longitudinal analyses, those who wrote about health maintenance and being productively engaged in work had better CVH an average of nearly 12 years later. Further, coping was the only source of well-being that was prospectively associated with better CVH in models that controlled for sociodemographic characteristics, word count, and CVH at MIDUS II (when participants wrote about well-being).

It is not surprising that individuals who endorsed health maintenance as important to their well-being experienced better CVH. Some aspects of health maintenance – including engaging in physical activity, eating well, managing weight, getting adequate sleep, and abstaining from tobacco – directly align with CVH measurement (Lloyd-Jones et al., 2022a). Other subthemes such as engaging in preventive health care and taking care of one's physical and mental health also contribute to health promotion (see illustrative quote in Supplemental Table S1). The other sources of well-being that were most robustly related to CVH (i.e., planning and organization, work) may similarly promote health via their focus on setting goals, having routines, and being productively engaged in formal employment or other rewarding activities (e.g., volunteering in the community, caring for grandchildren, engaging in hobbies). This is consistent with evidence suggesting that individuals who tend to be goal-oriented and organized (key markers of conscientiousness) or have a purpose derived from meaningful activities tend to show healthier cardiovascular biomarkers and behaviors (Amano et al., 2020; Bogg and Roberts, 2004; Burr et al., 2016; Estrella et al., 2020; E. S. Kim et al., 2020; Sutin et al., 2018).

Utilizing coping strategies also emerged as a contributor to well-being that predicted better CVH in longitudinal analyses. Experiencing challenges or stressors is an inevitable part of life. However, those with inadequate coping strategies or those who deal with ongoing, chronic stress may have elevated risk for CVD and poor CVH (Brewer et al., 2018; Kivimäki and Steptoe, 2018). Responding to challenges with coping strategies that minimize the harmful effects of stress – including being resilient and mindful, as well as demonstrating self-regulation and personal mastery – may support cardiovascular-related outcomes in the long term (J. H. Kim et al., 2020; Kubzansky et al., 2011; Loucks et al., 2015; Roepke and Grant, 2011).

Beyond individual sources of well-being that corresponded with healthier cardiovascular outcomes, identifying more sources of well-being in one's life was also associated with better CVH. In fully adjusted concurrent and longitudinal models, people who described more themes that contributed to their well-being experienced better CVH. These findings were attenuated when controlling for baseline CVH, but it may be challenging for the effects of any factor to predict above and beyond the outcome at baseline (as was evident with the analyses by individual theme). Nonetheless, this finding is consistent with previous research (Guimond et al., 2022) and raises interesting possibilities for subsequent investigations. Future research could investigate if merely having more sources of well-being matters, if a diverse set is key, if certain combinations are important, and if effects are additive or multiplicative. For the most part, interaction terms between well-being sources and sociodemographic factors (age, gender,

education, race) were not significantly different from zero when predicting CVH in cross-sectional and longitudinal models (the one exception was the interaction between self-awareness and gender in longitudinal models). This suggests that associations between sources of well-being and CVH were largely similar among sociodemographic subgroups. However, future work should examine how intersectional identities (e.g., subgroups based on age and gender and race) affect the sources of well-being mentioned in responses and if those differences matter for CVH and its subcomponents. It would also be valuable to confirm potential gender differences in how self-awareness as a source of well-being is related to CVH both concurrently and over time.

Strengths of this investigation include a mixed methods analytic approach embedded within a national cohort, ample data from diverse participants, longitudinal analyses across a mean of nearly 12 years, and adjustment for potential confounders. Yet several limitations should be considered when interpreting the results. First, only four of the eight components of CVH were clinically assessed. The health behaviors of diet, physical activity, nicotine exposure, and sleep were self-reported, which may be subject to self-report bias or other measurement error. Second, although the overall MIDUS Study is a national sample, those who participated in the biomarker assessments were more highly educated than those who did not participate (Love et al., 2010). That said, there was still a good distribution of educational achievement in our analytic sample and no other sociodemographic differences were evident for those who did versus did not participate in the biomarker assessment (Love et al., 2010). The finding that older adults had better CVH in longitudinal analyses may be related to selective attrition, where less healthy older adults were less likely to participate in the MIDUS III biomarker assessment. It is likewise possible that individuals from backgrounds not well-represented in the MIDUS cohort (e.g., race-/ethnicities beyond White and Black) may endorse other themes of well-being. Thus, future research will need to implement mixed methods approaches in other, diverse cohorts (Willen et al., 2022).

Finally, this study focused on major themes of well-being, providing a high-level overview of how key sources of well-being may be relevant for physical health over time. The current project therefore represents an initial step toward understanding which sources of well-being matter for CVH, but future research should interrogate the finer-grained subthemes that emerged in responses. For example, a substantial amount of research demonstrates that positive social relationships are beneficial for physical health and longevity (Holt-Lunstad, 2018; Holt-Lunstad et al., 2010). Although the qualitative data in the present study allowed us to examine whether positive relations in general were related to CVH, we did not consider specific dimensions such as emotional and physical intimacy, communication, and forgiveness. Some of these more refined facets of positive relationships may be more strongly related to CVH than others or the overall construct of positive social relationships. Other analytic approaches, such as large language models or cluster analysis, would also be worth exploring to capture which well-being themes and subthemes tend to co-occur and whether various clusters are more strongly related to CVH than others. Person-centered strategies like latent class analysis may be particularly useful for identifying which themes and subthemes were frequently mentioned together, and future research can examine whether certain combinations of well-being themes and subthemes are most strongly related to CVH concurrently and over time.

Taken together, this study implemented a mixed methods approach that allowed a diverse sample of midlife and older adults to describe, in their own words, what matters to their sense of well-being and how this relates to CVH over time. Consistent with previous research on the psychosocial correlates of CVH (Santos et al., 2024), findings indicated that better CVH was evident when individuals described maintaining their health, planning and organizing, engaging productively in work, and implementing coping strategies as key to their well-being. These findings contribute to a better understanding of how well-being operates in whole lives and how well-being contributes to CVH in the population.

CRediT authorship contribution statement

Julia K. Boehm: Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Monica Adams:** Writing – review & editing, Software, Project administration, Data curation. **Jennifer Morozink Boylan:** Writing – review & editing, Supervision, Software, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Ethics approval

MIDUS Study procedures were approved by Institutional Review Boards at the University of Wisconsin, Madison and all participants provided written informed consent.

Declaration of competing interest

The authors have no conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2025.117903>.

Data availability

De-identified data and documentation for the MIDUS study are available at <https://www.icpsr.umich.edu/web/ICPSR/series/203>. Analytic code is available at <https://osf.io/jqsmh/>.

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