Emotional Health

Happiness and Life Satisfaction Prospectively Predict Self-Rated Health, Physical Health, and the Presence of Limiting, Long-Term Health Conditions

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Abstract

Purpose. *To examine the effect of happiness and life satisfaction on health.*

Design. *Longitudinal data from waves 1 and 3, conducted in 2001 and 2004, respectively, of the Household Income and Labour Dynamics in Australia survey.*

Setting. *Australia.*

Subjects. *A total of 9981 respondents aged 18 years and older.*

Measures. *Outcomes were self-reported health; the absence of long-term, limiting health conditions; and physical health. Happiness was assessed with the following question: "During the past 4 weeks, have you been a happy person"? Life satisfaction was determined with the following question: "All things considered, how satisfied are you with your life"?*

Analysis. *We used multiple regression analysis to estimate odds ratios (ORs), beta coefficients ($\hat{\beta}$), and 95% confidence intervals (CIs) for the associations between baseline happiness or life satisfaction and health at wave 3.*

Results. *Baseline happiness and life satisfaction both were positively associated at wave 3 with excellent, very good, or good health (OR = 1.50, CI = 1.33–1.70, $p < .0001$; and OR = 1.62, CI = 1.27–2.08, $p < .0001$, respectively); with the absence of long-term, limiting health conditions (OR = 1.53, CI = 1.35–1.75, $p < .0001$; and OR = 1.51, CI = 1.25–1.82, $p < .0001$, respectively); and with higher physical health levels ($\hat{\beta} = .99$, CI = .60–1.39, $p < .0001$; and $\hat{\beta} = .99$, CI = .20–1.78, $p < .0145$, respectively).*

Conclusion. *This study showed that happier people and those who were more satisfied with their lives at baseline reported better health (self-rated health; absence of limiting, long-term conditions; and physical health) at the 2-year follow-up when adjusted for baseline health and other relevant covariates. (Am J Health Promot 2008;23[1]:18–26.)*

Key Words: Happiness, Life Satisfaction, Self-Rated Health, Long-Term Health Conditions, Physical Health. Manuscript format: research; Research purpose: modeling/relationship testing; Study design: nonexperimental; Outcome measure: behavioral, morbidity; Setting: national; Health focus: social health; Strategy: skill building/behavior change, incentives, policy; Target population age: adults; Target population circumstances: education/income level

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INTRODUCTION

Happiness and subjective well-being have received much less attention in medicine than negative affect and mental disorder. This mainly is because prolonged or extreme negative affect may produce serious problems for individuals and society[1] and because, traditionally, more funding has been available for studying mental disorders.[2,3] With the emergence of the new field of positive psychology,[3] more research now is directed at investigating the protective and health-promoting aspects of salubrious experience. Similarly, editors in major medical journals[4,5] suggest that happiness and well-being are ideas "whose time has come."[4]

A longitudinal study of 180 Catholic nuns (the Nun Study) in the United States showed an association between positive emotions such as happiness, love, and hope, which were assessed from autobiographies written at a young age (mean age, 22 years), and survival at ages 75 to 95 years. The risk of mortality in the lowest quartile of positive emotions—that is, nuns with the fewest positive emotions—was 2.5 times that of the highest quartile.[6] In a 20-year study of initially healthy men from the Finnish Twin Cohort, Koivumaa-Honkanen et al.[7] reported that life satisfaction—defined as interest in life, happiness, and general ease of living—was associated with decreased disease mortality after adjustment for marital status, social class, smoking, and physical activity. A study of 407 men, infected with human immuno-

deficiency virus (HIV), from the San Francisco Men's Health Study showed that positive affect predicted a lower risk of HIV mortality after adjustment for depression, antiretroviral use, and sociodemographic factors.[8] To our knowledge, happiness and life satisfaction have never been prospectively associated with self-reported health in the general population.

We employed longitudinal data from a representative population-based sample in Australia to examine the association of baseline happiness and life-satisfaction with self-rated health, absence of limiting, long-term health conditions and physical health, after adjusting for health measures and relevant socioeconomic and behavioral factors at baseline. We hypothesized that happiness and life satisfaction are associated with better health.

METHODS

Design

We used data from waves 1 and 3 of the Household Income and Labour Dynamics in Australia survey, a national longitudinal study based on a multistage area sample of households. The first wave of this annual survey was completed in 2001 and involved face-to-face interviews with all household members aged 15 years and older. Interviews were obtained from 7982 households, which represented 66% of all households that were identified as in-scope. This in turn generated a sample of 15,127 people eligible for interview, 13,969 of whom were interviewed. Follow-up interviews have been conducted for subsequent waves and have generated samples of 13,041 people in wave 2 (completed in 2003) and 12,728 people in wave 3 (completed in 2004). The survey is described in more detail elsewhere.[9] The study was approved by the University of Melbourne Human Research Ethics Committee.

Sample

We used data from a subsample of 9981 respondents who were aged 18 years and older in wave 1 and who were also surveyed in wave 3.

Measures

The outcome measures were three indicators of respondents' health status at wave 3: self-reported health; the absence of long-term, limiting health conditions; and the physical health summary score from the Short-Form Health Survey (SF-36). Self-reported health was determined by responses to the question, "In general, would you say your health is excellent, very good, good, fair, or poor"? The item was dichotomized as excellent, very good, and good combined versus the two other responses combined. This dichotomy is the most commonly used in health research.[10] Although only a single item, this global measure of health has strong predictive validity for mortality independent of other physiological, behavioral, and psychosocial factors.[11,12] The absence of limiting, long-term health conditions was assessed with the question, "Do you have any long-term health conditions, impairments, or disabilities that restrict you in everyday activities and have lasted, or are likely to last, for 6 months or more"? A showcard was presented that listed 17 disabilities and health conditions, such as sight problems not corrected by glasses or contact lenses, chronic or recurring pain, limited use of arms or fingers, and any mental illness that requires help or supervision. Respondents answered yes or no to this question. Limiting conditions in this context refers to one or more limiting conditions. Physical health was measured using the physical health summary scale from the SF-36. The SF-36 assesses health status in eight domains (physical functioning, role limitations due to physical problems, bodily pain, general health perceptions, mental health, role limitations due to emotional problems, social problems, and vitality) that are often compressed into two scales that indicate physical and mental health.[13] The physical health scale was standardized according to Australian population norms[14] to have a mean of 50 and a standard deviation of 10, in which higher scores indicate better health. The SF-36 has good construct validity, high internal consistency, and high test-retest reliability.[13,15]

All covariates were measured at wave 1. Happiness was assessed with the question, "During the past 4 weeks, have you been a happy person"? The six responses were all of the time, most of the time, a good bit of the time, some of the time, a little of the time, and none of the time. We dichotomized the six categories to all of the time or most of the time combined versus all other categories combined. Single-item measures of happiness similar to this have been used widely elsewhere and have been valid and reliable indicators of subjective well-being.[16–18] Life satisfaction was determined with the question, "All things considered, how satisfied are you with your life"? Responses were given on a 10-point scale that used endpoints of 0 (totally dissatisfied) and 10 (totally satisfied). Responses were coded into a dissatisfied category (responses of 5 or less) and a satisfied category. Single-item, global reports of life satisfaction have good internal consistency, have moderate stability, and are sensitive to changing life circumstances. They have a moderate level of convergence with informant and spouse reports, and they predict suicide and depression.[17]

We classified smoking status into two categories: never-smokers/ex-smokers and current smokers. Alcohol consumption was coded as consumption less than or equal to the amount that minimizes short- and long-term health risks according to the Australian Alcohol Guidelines[19] and as consumption greater than this level. Physical activity was determined according to the Physical Activity Guidelines for Australians,[20] and vigorous exercise three times a week was distinguished from exercise at less than this level. Education was categorized into three groups, and income was categorized into four groups, as shown in the tables. Occupation was coded based on the Australian Standard Classification of Occupations[21] and was divided into blue-collar, including trades people, production workers, transport workers, and laborers; white-collar, including clerical, service, and sales workers; and professionals, including managers, administrators, professionals, and associated professionals.

Analysis

Statistical analyses were performed with Stata version 8.2[22] on cases with complete data for all covariates. We used logistic regression to compute odds ratios (ORs) and confidence

intervals (CIs) to examine the association of baseline happiness and life satisfaction with self-rated health and with the presence of limiting, long-term health conditions at wave 3. Normal linear regression was used to examine the association of baseline happiness and life satisfaction with physical health at wave 3. The svy commands in Stata were used to compute robust standard errors and to account for the effects of the complex sample design.

RESULTS

Table 1 shows the sample characteristics and the percentage of participants who had good, very good, or excellent health, the percentage who had no long-term health conditions, and the mean physical health summary score for each sociodemographic group. About 63% and 92% of respondents reported themselves to be happy most or all of the time and to be satisfied with life, respectively. The proportion of respondents with better health at follow-up was notably larger among those who were happy or were satisfied with life. For example, those who were satisfied with life were about twice as likely to report good, very good, or excellent health at follow-up (46% vs. 24%).

Table 2 provides adjusted ORs for the association of baseline happiness and the covariates with each outcome. The odds of reporting good health were estimated as 1.50 times greater for those who were happy most or all of the time than for others (95% CI = 1.33–1.71, $p < .0001$). Similarly, the odds of having no limiting, long-term health conditions were 1.53 times greater for those who were happy most or all of the time than for others (95% CI = 1.35–1.75, $p < .0001$). Table 2 also shows the adjusted regression coefficients for the association of covariates with physical health. Being happy most or all of the time was associated with an increase of one unit of physical health (95% CI = .60–1.39, $p < .0001$, adjusted $R^2 = .50$).

Table 3 shows the adjusted ORs for the association of baseline life satisfaction and the covariates with each outcome. The odds of reporting good health were 1.62 times greater for respondents who were satisfied with their life than for those who were dissatisfied (95% CI = 1.27–2.08, $p = .0001$). The odds of having no limiting, long-term health conditions were an estimated 1.51 times greater for those who were satisfied with their life than for those who were dissatisfied (95% CI = 1.25–1.82, $p < .0001$). Finally, linear regression analysis (Table 3) indicated that satisfaction with life was associated with an increase of one unit of physical health (95% CI = .20–1.78, $p = .0145$, adjusted $R^2 = .50$).

The results presented in Tables 2 and 3 consistently show that baseline health, along with being a nonsmoker, exercising more, being younger, having a higher income, and having a professional or white-collar occupation (compared with having a blue-collar occupation, being unemployed, or not being in the labor force), were associated with good self-rated health, with having no limiting, long-term health conditions, and with better physical health at follow-up. Being male was only associated with having limiting, long-term conditions. There was some evidence that respondents who were married or who were in a *de facto* relationship had better physical health than those who were separated, divorced, or widowed. Education and alcohol consumption were not associated with any of the health indicators. Baseline health was the strongest predictor in all models.

DISCUSSION

This study used longitudinal data from a representative sample of adults in Australia. We found that happier people and those who were more satisfied with their lives at baseline reported better health (self-rated health; an absence of limiting, long-term conditions; and physical health) at the 2-year follow-up after adjustment for baseline health, smoking, drinking, physical activity, and sociodemographic factors.

Our findings about the protective effects of a younger age, of being a nonsmoker, and of exercise are well-known.[23–26] Although sex was not related to self-rated or physical health, we found that men were more likely than women to experience limiting, long-term health conditions. The lack of an association between sex and self-rated health has been reported in numerous studies.[27–30] However, our finding about the sex differences in limiting, long-term conditions is different from other studies, which reported no relationship.[28,30,31] Further research that controls for relevant factors such as psychological, social, and environmental factors[32] is required to gain more knowledge about this relationship in Australia.

Respondents who were separated, divorced, or widowed had slightly lower physical health scores than those who were married or in a *de facto* relationship. Epidemiologic studies consistently find that mortality is lower in married than in nonmarried people,[33–35] which may reflect the protective effect of social support and integration within the context of a long-term relationship. However, the relationship between marital status and physical health is less clear. Bennett found that marital status did not affect self-reported health in a uniform way, but changes in marital status did.[36] For instance, recently divorced people reported being in poorer health than people who were married. Our data revealed little longitudinal within-person variations in marital status and did not allow us to examine the effect of marital conjugation or separation on health.

Our results suggest that there is no association between alcohol consumption and any of the health indicators. Consumption of up to two drinks per day for men and one drink per day for women typically have been associated with a lower risk of coronary heart disease in observational studies, which suggests that moderate consumption has a protective effect. However, recent research has questioned this finding[37,38] and has shown that a variety of confounders exist that differ between nondrinkers and moderate drinkers. Naimi et al.[38] found that, after controlling for age and gender, nondrinkers were more likely than drinkers to be nonwhite, to have lower education and income, to have poor access to health care, to have comorbid health conditions, to have lower levels of mental well-being, and to have worse general health. Moderate drinkers ap-

Table 1
Sample Characteristics and Bivariate Associations With Self-Rated Health; the Presence of Limiting, Long-Term Conditions; and Physical Health

Covariates at Wave 1	% in Sample (N = 9981)	% Having Good/Very Good/Excellent Health at Wave 3	% Having No Limiting Conditions at Wave 3	Mean Physical Health Summary Score at Wave 3
Total population	100.00	43.8	69.1	48.4
Happiness				
A good bit of the time or less	37.2	32.5	62.6	47.5
Most or all of the time	62.8	51.0	73.7	49.0
Life satisfaction				
Dissatisfied	8.3	23.9	50.4	45.0
Satisfied	91.6	45.6	70.8	48.7
Smoking status				
Nonsmoker	77.3	46.5	69.6	48.4
Smoker	22.7	36.1	69.1	48.6
Exercise				
Less than three times a week	50.2	36.7	65.9	47.1
Three times a week or more	49.8	51.6	73.3	49.8
Alcohol consumption				
More than recommended level	22.9	45.8	75.9	50.3
Less than recommended level	77.1	44.0	68.3	48.0
Age (y)				
18–24	7.9	58.1	87.0	53.7
25–39	31.4	56.0	81.8	52.3
40–54	31.0	43.3	73.3	49.3
55+	29.6	27.8	46.7	41.7
Sex				
Female	53.7	43.7	70.0	48.2
Male	46.3	44.0	68.1	48.7
Marital status				
Married/*de facto*	69.5	44.6	70.8	48.6
Separated/divorced/widowed	14.8	31.6	51.1	43.5
Single	15.6	50.9	77.5	51.8
Education				
High school or less	51.3	38.7	64.7	47.3
Diploma or trade certificate	28.9	44.2	69.9	48.5
University degree	19.7	57.3	80.3	51.3
Household income (AUD $)				
Less than 25,000	22.8	26.9	47.4	42.5
25,000–49,999	24.2	40.1	65.1	47.7
50,000–74,999	22.7	50.1	77.3	50.5
75,000 or more	30.4	53.1	81.0	51.2
Occupation				
Unemployed/not in labor force	37.9	29.2	49.7	43.3
Blue-collar	16.4	46.4	78.3	50.7
White-collar	17.0	50.9	82.5	51.3
Professional	28.8	57.9	82.2	51.8

pear to have many characteristics that favor their survival over nondrinkers, but few differences are because of drinking itself. In the present study, there was very little evidence of an effect of alcohol consumption on health after adjustment for a variety of social and lifestyle factors, consistent with Mukamal et al.[37] and Naimi et al.[38]

Our finding that past self-reported health is the strongest predictor of present self-reported health is consistent with previous literature.[39–41] A study in Finland showed that about 60% of respondents rated their self-reported health status, measured on a five-point scale, at exactly the same level after 1 year. Most individual transitions occurred between adjoining levels.[39] Similarly, a study in Canada revealed that the strongest predictor of

Table 2
Regression of Self-Rated Health; the Presence of Limiting, Long-Term Conditions; and Physical Health on Happiness and Other Covariates*

	Adjusted OR (95% CI) of Having Good/Very Good/Excellent Health (n = 8479)†	Adjusted OR (95% CI) of Having No Limiting Conditions (n = 9147) †	Adjusted $\hat{\beta}$ Coefficient, (95% CI) for Physical Health (n = 7990) †
Happiness			
A good bit of the time or less	1.00	1.00	0.00
Most or all of the time	1.50 (1.33 to 1.71)	1.53 (1.35 to 1.75)	0.99 (0.60 to 1.39)
p	< 0.001	< 0.001	< 0.001
Self-rated health			
Fair/poor	1.00	—	—
Good/very good/excellent	8.02 (7.11 to 9.05)	—	—
p	< 0.001		
Limiting, long-term conditions			
Yes	—	1.00	—
No	—	9.72 (8.43 to 11.22)	—
p		< 0.001	
Physical health	—	—	0.59 (0.57 to 0.62)
p			< 0.001
Smoking status			
Nonsmoker	1.00	1.00	0.00
Smoker	0.67 (0.57 to 0.77)	0.83 (0.71 to 0.97)	−0.77 (−1.22 to −0.31)
p	< 0.001	0.016	0.001
Exercise			
Less than three times a week	1.00	1.00	0.00
Three times a week or more	1.44 (1.28 to 1.61)	1.22 (1.09 to 1.37)	0.55 (0.17 to 0.94)
p	< 0.001	0.001	0.005
Alcohol consumption			
More than recommended level	1.00	1.00	0.00
Less than recommended level	1.00 (0.87 to 1.15)	0.96 (0.83 to 1.12)	0.32 (−0.09 to 0.74)
p	0.983	0.637	0.129
Age (y)			
18–24	1.00	1.00	0.00
25–39	0.96 (0.73 to 1.25)	0.66 (0.48 to 0.90)	−0.97 (−1.64 to −0.29)
40–54	0.58 (0.44 to 0.76)	0.44 (0.32 to 0.61)	−2.28 (−3.03 to −1.53)
55+	0.45 (0.34 to 0.61)	0.26 (0.19 to 0.37)	−4.60 (−5.38 to −3.81)
p	< 0.001	< 0.001	< 0.001
Sex			
Female	1.00	1.00	0.00
Male	0.91 (0.81 to 1.03)	0.85 (0.75 to 0.96)	−0.22 (−0.62 to 0.17)
p	0.139	0.008	0.267
Martial status			
Married/*de facto*	1.00	1.00	0.00
Separated/divorced/widowed	0.96 (0.80 to 1.14)	0.84 (0.70 to 1.01)	−0.85 (−1.46 to −0.24)
Single	1.08 (0.90 to 1.28)	1.01 (0.82 to 1.25)	0.01 (−0.57 to 0.58)
p	0.572	0.704	0.021
Education			
High school or less	1.00	1.00	0.00
Diploma or trade certificate	1.07 (0.94 to 1.23)	1.09 (0.93 to 1.27)	−0.09 (−0.52 to 0.34)
University degree	1.19 (1.01 to 1.40)	1.23 (1.02 to 1.48)	0.26 (−0.27 to 0.79)
p	0.104	0.100	0.472
Household income (AUD $)			
Less than 25,000	1.00	1.00	0.00
25,000–49,999	1.15 (0.95 to 1.38)	1.15 (0.96 to 1.38)	0.47 (−0.17 to 1.11)
50,000–74,999	1.35 (1.10 to 1.65)	1.39 (1.14 to 1.71)	0.79 (0.13 to 1.45)
75,000 or more	1.33 (1.10 to 1.60)	1.69 (1.37 to 2.08)	0.93 (0.26 to 1.59)
p	0.011	< 0.001	0.044
Occupation			
Unemployed/not in labor force	1.00	1.00	0.00
Blue-collar	1.30 (1.08 to 1.57)	1.60 (1.31 to 1.96)	1.36 (0.74 to 1.97)
White-collar	1.29 (1.06 to 1.56)	1.86 (1.53 to 2.27)	1.42 (0.83 to 2.01)
Professional	1.58 (1.32 to 1.89)	1.74 (1.45 to 2.10)	1.48 (0.96 to 2.00)
p	< 0.001	< 0.001	< 0.001

* Logistic regression was used for self-rated health and for limiting, long-term health conditions; normal linear regression was used for physical health.
† OR indicates odds ratio; CI, confidence interval.

Table 3
Regression of Self-Rated Health; the Presence of Limiting, Long-Term Conditions; and Physical Health on Life Satisfaction and Other Covariates*

	Adjusted OR (95% CI) of Having Good/Very Good/Excellent Health (n = 8530)†	Adjusted OR (95% CI) of Having No Limiting Conditions (n = 9221) †	Adjusted $\hat{\beta}$ Coefficient (95% CI) For Physical Health (n = 8002) †
Life satisfaction			
Dissatisfied	1.00	1.00	0.00
Satisfied	1.62 (1.27 to 2.08)	1.51 (1.25 to 1.82)	0.99 (0.20 to 1.78)
p	< 0.001	< 0.001	< 0.001
Self-rated health			
Fair/poor	1.00	—	—
Good/very good/excellent	8.54 (7.60 to 9.59)	—	—
p	< 0.001		
Limiting, long-term conditions			
Yes	—	1.00	—
No	—	9.93 (8.60 to 11.45)	—
p		< 0.001	
Physical health	—	—	0.59 (0.57 to 0.62)
p value			< 0.001
Smoking status			
Nonsmoker	1.00	1.00	0.00
Smoker	0.68 (0.58 to 0.78)	0.84 (0.72 to 0.98)	−0.80
p	< 0.001	0.027	0.001
Exercise			
Less than three times a week	1.00	1.00	0.00
Three times a week or more	1.45 (1.30 to 1.63)	1.25 (1.12 to 1.40)	0.62 (0.24 to 1.00)
p	< 0.001	< 0.001	0.001
Alcohol consumption			
More than recommended level	1.00	1.00	0.00
Less than recommended level	1.01 (0.88 to 1.16)	0.96 (0.83 to 1.12)	0.33 (−0.09 to 0.75)
p	0.072	0.630	0.122
Age (y)			
18–24	1.00	1.00	0.00
25–39	0.96 (0.74 to 1.25)	0.65 (0.48 to 0.90)	−0.99 (−1.67 to −0.31)
40–54	0.59 (0.45 to 0.78)	0.44 (0.32 to 0.61)	−2.29 (−3.05 to −1.54)
55+	0.47 (0.35 to 0.63)	0.27 (0.19 to 0.38)	−4.62 (−5.41 to −3.83)
p	< 0.001	< 0.001	< 0.001
Sex			
Female	1.00	1.00	0.00
Male	0.91 (0.81 to 1.03)	0.86 (0.76 to 0.97)	−0.21 (−0.60 to 0.18)
p	0.121	0.015	0.293
Martial status			
Married/*de facto*	1.00	1.00	0.00
Separated/divorced/widowed	0.97 (0.81 to 1.16)	0.86 (0.72 to 1.02)	−0.83 (−1.44 to −0.22)
Single	1.06 (0.89 to 1.27)	1.00 (0.81 to 1.23)	−0.06 (−0.63 to 0.52)
p	0.705	0.227	0.028
Education			
High school or less	1.00	1.00	0.00
Diploma or trade certificate	1.07 (0.93 to 1.22)	1.08 (0.92 to 1.26)	−0.13 (−0.57 to 0.30)
University degree	1.17 (1.00 to 1.37)	1.22 (1.02 to 1.47)	0.23 (−0.30 to 0.76)
p	0.148	0.106	0.459
Household income (AUD $)			
Less than 25,000	1.00	1.00	0.00
25,000–49,999	1.13 (0.94 to 1.36)	1.11 (0.92 to 1.33)	0.46 (−0.18 to 1.10)
50,000–74,999	1.31 (1.08 to 1.61)	1.34 (1.09 to 1.64)	0.75 (0.09 to 1.42)
75,000 or more	1.28 (1.06 to 1.55)	1.62 (1.31 to 1.99)	0.90 (−0.60 to 0.18)
p	0.031	< 0.001	0.065
Occupation			
Unemployed/not in labor force	1.00	1.00	0.00
Blue-collar	1.30 (1.08 to 1.57)	1.61 (1.32 to 1.97)	1.34 (0.73 to 1.95)
White-collar	1.28 (1.06 to 1.55)	1.88 (1.54 to 2.28)	1.41 (0.82 to 2.00)
Professional	1.57 (1.31 to 1.87)	1.73 (1.44 to 2.09)	1.47 (0.94 to 2.00)
p	< 0.001	< 0.001	< 0.001

* Logistic regression was used for self-rated health and for limiting, long-term health conditions; normal linear regression was used for physical health.
† OR indicates odds ratio; CI, confidence interval.

respondents' present self-rated health was their self-rated health 2 years prior after controlling for baseline physical and mental health, social support, smoking, physical activity, and body mass index.[40] According to Baailis et al.,[40] the stability of self-rated health provides evidence for the enduring self-concept hypothesis, which suggests that self-rated health reflects people's established beliefs about their health rather than merely their spontaneous report of their health. The stability of self-rated health also indicates its usefulness in prospective studies[42,43] and in public health monitoring with repeated cross-sectional samples.[44]

Although there was strong support for a protective effect of education at the bivariate level, multivariate analyses showed no evidence of an educational effect. However, consistent with numerous previous studies, our data provided strong evidence that income and occupation were positively associated with self-reported health.[45,46] Galobardes et al.[47] have proposed several mechanisms for these protective effects. Occupation may affect health through psychosocial factors such as social networks, stress, control, and autonomy. Its health effect may also be due to specific exposures such as toxic environments or physical demand. Furthermore, better occupations reflect higher standing and, as such, are associated with privileges such as better residential facilities and easier access to better health care. Higher income is protective, because it provides access to better quality resources such as food and shelter, allows access to health services and health-enhancing leisure activities, and may foster self-esteem.

Some weaknesses of the study should be mentioned. First, owing to limitations in our dataset, we used single-item indicators of happiness and life satisfaction measured at a single occasion. Multi-item scales are preferable. Ryff[48] has developed reliable scales of subjective well-being related to dimensions of happiness such as self-acceptance, purpose of life, and positive relations with others. Similarly, Diener[49] has developed a widely used scale of global life satisfaction based on five questionnaire items. Kahneman[50] suggests that single-occasion measures of happiness are likely to be biased and argues for sampling moods, emotions, and other feelings at multiple random moments in respondents' daily lives. Multiple-occasion methods may provide more accurate values than single-occasion global happiness ratings.[17] Second, we were unable to control for community level predictors of health because of a lack of availability of data. The importance of predictors such as area disadvantage, income inequality, and social capital has been highlighted in many recent, multilevel studies.[51–53] The inclusion of these variables might attenuate the effects reported in this article. The third weakness of the study relates to respondent attrition, which was 20% between waves 1 and 3. Supplementary analyses not shown here revealed that attrition was not related to baseline health or happiness. However, it was associated with being a male, being younger, having low education, being dissatisfied with life, being a smoker, exercising less, and drinking excessively. The exact impact of attrition on results cannot be assessed. However, by including the correlates of attrition in the multivariate analyses, we have reduced bias as much as possible.

Little work has been done to specify the mechanisms of the effect of happiness on health. Steptoe et al.[54] examined the association between positive affect and health-related processes among 116 men and 100 women who took part in the Whitehall II psychobiology study. Positive affect was assessed by aggregating momentary experience samples of happiness (self-rating of happiness on a scale of 1 to 5) during a working day. Happiness in middle-aged men and women was associated with reduced neuroendocrine, inflammatory, and cardiovascular activity as measured by cortisol output, plasma fibrinogen, and heart rate, respectively. Cortisol is a stress hormone related to type 2 diabetes, hypertension, abdominal obesity, and autoimmune conditions.[55,56] Plasma fibrinogen is a predictor of coronary heart disease,[57,58] and elevated heart rate is associated with increased mortality.[59,60]

Recent theoretical and empirical work in positive psychology suggests several mechanisms for the protective effect of positive affect on health.[1] Fredrickson[1] cites emerging evidence that positive affect broadens an individual's cognition, span of attention, and repertoires of thoughts and actions. These, in turn, facilitate coping in adversity and can enhance physical health. Positive affect also corrects or undoes the ill effects of negative emotions (i.e., the undo hypothesis). Experiments have shown that positive affect can help cardiovascular recovery after a high-activation negative emotion.[61,62] Finally, positive affect produces resilience, which is shown to contribute to psychological well-being and growth and to physiological recovery.[63,64]

The utility of our findings within the field of health promotion would be limited if it is not possible to alter an individual's level of subjective well-being. Although some have argued that an individual's subjective well-being is stable over time regardless of the occurrence of good or bad events (i.e., the dynamic equilibrium theory),[18] recent research provides evi-

SO WHAT? Implications for Health Promotion Practitioners and Researchers

This article has provided strong evidence that subjective well-being and health are associated. This indicates that statistical analyses of health determination that do not adjust for subjective well-being may be mis-specified and may result in biased estimates of the effect of other predictors of health. We encourage health promotion researchers to include subjective well-being as an important covariate in multivariate analyses of the predictors of health. This is likely to be as important as routinely including socioeconomic indicators.

More research is needed in the following areas: investigating the mechanisms of the effect of subjective well-being on health; investigating the determinants of subjective well-being by using longitudinal data, which would allow an examination of the causal priority of variables; and developing and evaluating interventions to enhance subjective well-being.

dence that interventions can make people lastingly happier. In a random-assignment, placebo-controlled, internet study (n = 577), two interventions of a 1-week duration each increased happiness and decreased depression up to 6 months later. One intervention asked participants to write about three good things that happened each day and why they happened. The other intervention asked them to take an inventory of character strengths, which included such strengths as gratitude, hope, kindness, and open-mindedness. They then received individualized feedback about their top five strengths and were asked to use one of them in a new and different way every day.[65]

Happiness and life satisfaction not only are desired subjective states, but also they contribute to better health. Efforts to enhance an individual's subjective well-being should be regarded as a health promotion and disease prevention strategy.

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