

WHITEPAPER

Positive Health and Health Assets: Re-analysis of Longitudinal Datasets

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Executive Summary

Most approaches to health over the centuries have focused on the absence of illness. In contrast, we are investigating *Positive Health*—well-being beyond the mere absence of disease. In this article, we describe our theoretical framework and empirical work to date on Positive Health. Positive Health empirically identifies *health assets* by determining factors that predict health and illness over and above conventional risk factors. Biological health assets might include, for example, high heart rate variability, high levels of HDL, and cardiorespiratory fitness. Subjective health assets might include positive emotions, life satisfaction, hope, optimism, and a sense of meaning and purpose. Functional health assets might include close friends and family members; a stable marriage; meaningful work; participation in a social community; and the ability to carry out work, family, and social roles.

Health assets are desirable in their own right, but research has clearly demonstrated the relevance of biological assets and suggested the importance of functional health assets to overall health. Still to be determined is whether and how subjective health assets contribute to health-related outcomes, including:

- Longevity
- Morbidity
- Quality-adjusted life years
- Prognosis when illness strikes
- Health care utilization and cost

Even less is known about the inter-relations between subjective, functional, and biological health assets.

We have begun a program of research that considers the relevance of these assets in relation to health, and we describe several of our recent

studies. Initial work has focused on subjective health assets, with additional research planned to look at the inter-relations between subjective, functional, and biological health assets.

This work builds on prior research demonstrating strong links between psychosocial factors and cardiovascular disease (CVD) and uses existing datasets to explore how psychological assets influence cardiovascular health and disease. Because existing datasets are heavily weighted toward what goes wrong in life, we

needed to derive valid measures of psychological assets from them. Having done so, our studies consistently show that subjective health assets are meaningfully associated with reduced risk of cardiovascular disease. Therefore, we believe that certain health assets may protect against illness and building these assets may be an effective and inexpensive strategy for prevention.

This white paper divides into three sections: the Overarching Endeavor, the First Empirical Studies, and the Measurement of Health Assets.

SECTION 1: The Overarching Endeavor: Defining Positive Health

The World Health Organization's definition of health is familiar. It is, unfortunately, largely a slogan, because most approaches to "health" over the centuries have focused on the absence of disease (Taylor, Denham and Ureda, 1982). Important as these approaches have been, is there something more? We all know the difference between getting out of bed in the morning and having no aches or pains, no congestion or constipation, and no illness or incapacitation versus getting out of bed feeling vigorous and ready to take on the world with enthusiasm. We know what it means to be resilient, not to fall ill when exposed to germs or stress, and to bounce back quickly from illness.

But a scientific discipline of *Positive Health*—well-being beyond the mere absence of disease—barely exists (cf. Ryff, Singer and Love, 2004; Seeman, 1989). Supported by two generous grants from the Robert Wood Johnson Foundation, we aim to encourage existing scientific and clinical disciplines to expand their conception of health by breaking through the zero point of the absence of disease to consider what is on the other side.

Familiar within the field of epidemiology are the population-level concepts of DALYs (disability-adjusted life years), HALYs (health-adjusted life years), and QALYs (quality-adjusted life years), which combine measures of morbidity and mortality into the same index (Gold, Stevenson and Fryback, 2002). Along these lines, HLE (happiness-adjusted life expectancy) measures the quality of life in a nation by forming the product of the average life expectancy and the average happiness (aka subjective life satisfaction) in that nation

(Veenhoven, 1996). Positive Health is the individual-level analogue of these constructs.

Since 2008, the Positive Psychology Center of the University of Pennsylvania has undertaken a Positive Health initiative (Seligman, 2008). Critical to this is first defining what is meant by positive physical health. To this end, we have identified assets in three "psychological" domains that seem relevant to health: biological, subjective, and functional. A critical question is whether and how these assets promote health. Building on a considerable literature suggesting that negative psychological factors may increase the risk of cardiovascular disease (Everson and Lewis, 2005), we began by focusing on potential psychological assets in relation to cardiovascular outcomes.

We will consider multiple health outcomes over the course of this program. Thus, we have identified existing longitudinal datasets in which we can conduct initial analyses and have been working with these datasets to see if "positive" assets—such as optimism, zest, and a sense of purpose in life—predict health and longevity, especially after taking account of the usual suspect "negative" attributes, i.e., the risk factors for illness like anger, anxiety, depression, cholesterol, unemployment, body-mass index, and the like. The long-term goal of this is to use what we learn from our framework and from re-analyzing the existing longitudinal datasets to design primary data collections that will fill important gaps in our knowledge and ultimately inform the development of interventions that create Positive Health.

The constructs we are considering can be examined from different vantages: as indicators of Positive Health, as predictors of Positive Health, or as outcomes of Positive Health. This is not conceptually problematic, but it does mean that these vantages need to be kept distinct in empirical research in order to avoid confounding of predictors, criteria, and outcomes.

BACKGROUND: POSITIVE PSYCHOLOGY

The Positive Health initiative was inspired by the example of positive psychology (Peterson, 2006; Seligman, 2002; Seligman and Csikszentmihalyi, 2000). Until recently, mental health, like physical health, was usually understood to be the absence of mental illness (cf. Jahoda, 1958). Positive psychology challenged this assumption, arguing that mental health is real, consisting of a measurable configuration of positive emotions, engagement, good relationships, meaning, and accomplishment (PERMA: Seligman, 2011). These states are by no means guaranteed by the mere absence of mental illness, nor are they obviated by its presence.

Positive psychology has attracted a good deal of attention from researchers, practitioners, and the general public. A substantial database has been created, theories have been proposed and tested, books have been written, and courses are being taught at colleges and universities around the world (Seligman, Steen, Park and Peterson, 2005). Interventions explicitly based on positive psychology are underway in education, business, and the military. And ideas from positive psychology have figured prominently in recent calls for national indicators of psychological well-being to supplement the economic indicators usually tracked (Diener, 2000; Diener and Seligman, 2004).

Despite occasional caricatures by critics of positive psychology, the perspective does not deny or ignore misery and suffering. Rather, positive psychologists believe that one of the best ways to address psychological problems is by leveraging psychological strengths (Park and Peterson, 2009; Peterson and Seligman, 2004), and the same point may hold when our attention turns to physical health. The vision is that people can draw on their health assets to prevent, overcome, sidestep, or cope with the illnesses and infirmities they experience.

DEFINING POSITIVE HEALTH EMPIRICALLY

Positive Health is the empirical study of health assets. A *health asset* is an individual factor that produces longer life, lower morbidity, lower health care expenditure, better prognosis when illness does strike, and/or higher quality of life. Aerobic fitness, supportive friends and family members, and a sense of purpose in life are *likely* examples. As noted, Positive Health, as a discipline, is patterned after positive psychology, an approach in which mental health is defined as more than the simple absence of mental illness but rather as the presence of specific psychological assets of PERMA—positive emotion, engagement, relationships, meaning, and achievement (Peterson, Park and Seligman, 2005; Seligman, 2011; Seligman and Csikszentmihalyi, 2000).

Like positive psychology, Positive Health is, first and foremost, empirical. Therefore, we use the word “likely” because we are agnostic about what factors are actual health assets. We seek to determine empirically which candidate health assets actually foster longer life, lower morbidity, lower health care utilization and cost, lower expenditures, better prognosis when illness does strike, and higher quality of life.

Positive Health proceeds by first identifying plausible health assets from the research literature, then using the best methods available (e.g., prospective data, measuring health assets when individuals are disease-free) to look longitudinally at whether each candidate health asset is associated with lower disease outcomes, holding risk factors constant. That is the first stage of the science and what this white paper concerns. The second stage is to develop and deploy interventions that build these health assets alone or in combination with traditional interventions. The third stage is to consider the comparative effectiveness of these interventions as opposed to or combined with traditional interventions and then measure their cost-effectiveness.

THREE CLASSES OF CANDIDATE HEALTH ASSETS

The very first task in the development of Positive Health is to identify likely candidate health assets, whose power to produce health outcomes can then be rigorously tested over and above risk factors. Like risk factors for illness, there are three classes of potential

health assets: biological, subjective, and functional. Candidate *biological health assets* are objectively measured and include, for example, heart rate variability and levels of HDL. Candidate *subjective health assets* are generally measured via self-report and include psychological states and traits like positive emotions, life satisfaction, optimism, meaning, and purpose. Candidate *functional health assets* are often measured by self-report and include having close friends and family members, a stable marriage, meaningful work, and participation in a social community. Other functional assets are related to aspects of functional performance, such as being able to climb two flights of stairs without being winded and being able to carry out chosen work, family, and social roles.

One of the key activities of developing Positive Health is identifying variables that are candidate health assets. These are derived from extensive literature reviews, but they have yet to be established as causal, which is the entire point of the studies we described. In the third section of this paper, the Measurement of Health Assets, we detail the range of candidate assets.

POSITIVE HEALTH IN RELATION TO OTHER APPROACHES TO GOOD HEALTH

Positive Health, as we conceive it, is related to three existing approaches concerned with good health: disease prevention, health promotion, and wellness. All are congenial to our initiative, but Positive Health has distinct emphases.

DISEASE PREVENTION

One of the triumphs of modern medicine and public health has been the direct and indirect targeting of the causes of disease and injury (Sagan, 1987). Swamps containing malaria-bearing mosquitoes have been drained; childbirth now happens under sterile circumstances; food is now inspected and dated for freshness; automobile seat belt laws have been passed and largely heeded; vaccines have been developed and made widely available; and the general public has heeded warnings about the risk of smoking, and cigarette use is down. Over the centuries, life expectancy has increased by leaps and bounds around the world, largely because so many diseases and injuries have been prevented (Brandt and Gardner, 2000).

Potentially fatal illness and Positive Health are not simple opposites, but neither are they completely independent of one another. One cannot easily evidence Positive Health if at death's door, and certainly not if one has crossed through it. So, Positive Health may be a prerequisite to preventing disease.

The target of disease prevention is, of course, preventing or delaying illness, and its sole interest in health assets is their possible use in preventing illness (Heymann, 2008). Positive Health overlaps with disease prevention in two ways: (a) the use of interventions to prevent disease and (b) the focus on early antecedents and early intervention strategies.

Positive Health is distinct from disease prevention in three ways. First, the targets of Positive Health are broader than just illness. For example, increased subjective well-being, mental health, exercise, and a good marriage are important *for their own sake* as well as being beneficial to reducing illness. Second, Positive Health is specifically interested in health assets and the benefits that these confer beyond signaling the absence of risk factors. Finally, Positive Health is specifically interested in using the information about health assets discovered empirically to create and deploy interventions that build those assets that are most relevant and to combine them with traditional interventions.

HEALTH PROMOTION

Health promotion helps people strive for “optimal health,” which is said to be a balance of physical, emotional, social, spiritual, and intellectual fitness (Naidoo and Wills, 2000). Lifestyle change to achieve optimal health is brought about by enhanced awareness of the need for change, increasing motivation, building skills, and supporting environments that provide Positive Health practices (O'Donnell, 2002, 2009). The target of good health is a goal that Positive Health shares with health promotion. Positive lifestyle interventions, such as increasing exercise, improving nutrition, and encouraging responsibility for healthy choices, is a second common goal of both endeavors (Dines and Cribb, 1993; Leddy, 2006).

Positive Health differs from health promotion in two ways. First, it is tied to the prevention of disease outcomes and prognosis once illness strikes as well as to achieving positive goals for their own sake. Second,

Positive Health is agnostic about what health assets are real, so it is steadfastly empirical. It moves from the longitudinal studies that isolate causal health factors to interventions building those health assets to considering their comparative effectiveness and ultimately assessing the cost-effectiveness.

WELLNESS

Wellness, by dictionary definition, is “the condition of good physical and mental health, especially when maintained by proper diet, exercise, and habits” (Dunn, 1961). As a health movement, it focuses on helping people become aware of the choices they can make to achieve good physical and mental health (Ralph and Corrigan, 2005). This focus is wholly consistent with our Positive Health initiative, and both share the goal of fostering interventions that target well-being (Garofalo, 1994).

Positive Health, in contrast, is an empirical science that seeks to build a science around health assets in order to discover what assets truly matter for health, what are the relevant strategies for building or enhancing these assets, whether interventions to build/enhance assets are effective for maintaining good health and reducing risk of illness, and how cost-effective these interventions are. Positive Health also targets disease prevention goals achieved by building these health assets. Wellness, on the other hand, often has a New Age flavor, which in itself is not objectionable but does run the risk of substituting ideology for science when alternative medicine interventions are not subjected to rigorous testing (Randi, 1987).

In sum, Positive Health is compatible with disease prevention, health promotion, and wellness, but it is an empirical and systematic discipline that subsumes the goals and methods of these other approaches to good health in a more general framework and employs an explicitly interdisciplinary scientific approach to build an evidence base to support (or refute) key premises.

EXISTING LITERATURE

Identifying health assets was a two-stage process. First, we reviewed the existing literature for candidates, which can be seen in Section 3. Second, we reanalyzed existing longitudinal studies to see which candidate health assets actually were associated with reduced

disease risk once established risk factors were taken into account.

We also conducted several reviews of the literature on subjective health assets and cardiovascular disease (CVD). First, we identified all the literature to date considering a broad set of subjective assets in relation to CVD (Boehm and Kubzansky, in press). In the second and third reviews, we broadened the scope to consider not only the epidemiologic literature, but also findings regarding how relevant subjective assets might be related to pathways leading to CVD, namely, via behavioral and biological function (Boehm and Kubzansky, 2012; Boehm and Kubzansky, in preparation). Next, we identified research issues still to be addressed with respect to optimism interventions and improved cardiac health (Peterson and Kim, 2011). These reviews also serve as our early efforts to integrate across subjective and biological health assets (cf. Peterson, Park and Kim, 2012, in press).

Our reviews highlighted several important issues. First, as we knew, the role of positive well-being in CVD has not garnered nearly as much research attention as the role of negative states and traits. When studies are done, they too often have a cross-sectional design rather than a more powerful longitudinal design. That said, when researchers have longitudinally investigated such constructs as positive affect, life satisfaction, optimism, vitality, and *ikigai* (meaning and purpose), relationships with good cardiac health are usually found. And, in the most compelling studies, negative states and traits are controlled, meaning that these positive effects indeed occur above and beyond any association with risk factors. Thus, the premise of our Positive Health project was confirmed.

Second, depending on the details, there are nuances. Studies have sometimes used patient samples and sometimes healthy samples. Along these lines, studies have looked at disease onset and disease progression, including recovery. Subjective health assets appear somewhat more relevant for first disease onset than for disease progression.

Third, the subjective health assets that have been considered in research, or might be considered, are numerous and presumably related. However, researchers have usually studied only one health asset at a time. Are there overriding factors—“latent variables”—that can bring some order here? Or do

some particular health assets confer more benefit for cardiac health than others? We found some evidence, for example, that optimism is more strongly related to good health than are simple measures of hedonic well-being (cf. Ryff, Singer and Love, 2004).

Fourth, given our focus on CVD, the relationship of health assets to other illnesses remains largely unknown. The case has been well made with respect to CVD. What about cancer or the common cold? Further studies using the lessons we have learned to date in our focus on CVD are needed.

Fifth, there is limited work on the process by which subjective assets might mitigate CVD. This work generally follows a traditional epidemiologic approach, neglecting to explore the pathways that lead from health assets to good health. We suspect that mechanisms are numerous, including direct biological pathways as well as indirect behavioral pathways entailing lifestyle choices, like smoking, drinking, and exercising. In recent work, we have looked more deeply at what is known about the relationship between subjective assets and health-related behaviors (Boehm and Kubzansky, in preparation), and we have begun to make recommendations for important future directions.

Finally, we observed in the course of our reviews that studies of Positive Health assets to date are held to a higher methodological standard than studies of risk factors. In order to be published in a peer-reviewed journal, a study of Positive Health assets must control for negative risk factors and show that the positive asset matters above and beyond the absence of the negative, whereas a study of risk factors can be simply that, with no attempt to show that risk factors matter above and beyond the absence of health assets. So, for example, anger is a risk factor for cardiovascular morbidity and mortality. Given that anger correlates with poor relationships, low optimism, and lack of meaning, it seems obvious to wonder if the influence of anger per se would be diminished were we to take into account good relationships with other people, levels of optimism, or meaning in life.

In sum, our literature reviews show that subjective health assets indeed play a role in cardiovascular health. Although some inconsistencies exist, depending on measures and outcomes used, the evidence is strong. Moreover, for disease-related endpoints, the protective effect of positive psychological well-being is mostly independent of ill-being as well as other conventional coronary risk factors.

SECTION 2: Empirical Studies of Positive Health

Having identified candidate health assets in our reviews, we combed the literature for existing longitudinal studies of CVD that measured risk factors carefully and had at least some measures of one or more of the candidate health assets. Many of the candidate health assets, such as life satisfaction and a good marriage, are desirable in their own right, but we wanted to know whether they influenced such targets as mortality, morbidity, health care expenditure, mental health and mental illness, quality adjusted life years, and prognosis when illness strikes beyond effects of traditional risk factors.

We identified several existing longitudinal datasets with high-quality measures of health outcomes in which candidate health assets could be assessed, and we investigated whether these assets predicted illness and well-being in a manner distinct from the traditional risk factors—the central focus of all of the existing datasets.

We focused on cardiovascular disease because this is the target of the most methodologically sophisticated longitudinal studies and because it has relatively identifiable endpoints, e.g., heart attack, heart failure, and death. Moreover, it is currently the leading cause of death in the United States. We limited our attention to *subjective* health assets because so little work has focused on the relationship between subjective assets to CVD. Subsequent work will consider joint effects across biological and functional health assets and integrate the findings in the different domains.

We initially considered 12 existing datasets that seemed promising. Of these, four best met the selection criteria: the Whitehall II Cohort, the Normative Aging Study, the Health and Retirement Study (HRS), and the Grant Study. We are now working with each of them. What follows is a summary of these datasets.

Whitehall II Cohort: Predicting Coronary Heart Disease From Optimism and Emotional Vitality (Boehm, Peterson, Kivimaki and Kubzansky, 2011a)

Research suggests that subjective well-being is associated with cardiovascular health. However, much of this research uses elderly samples and has not determined the pathways by which well-being influences cardiovascular disease or whether effects are similar for men and women. This study investigated two aspects of well-being—emotional vitality and optimism—and incident coronary heart disease (CHD) in a sample of middle-aged men and women and considered potential mediating factors.

Participants were 7,942 British civil servants who had not previously experienced a cardiovascular event. Incident CHD (i.e., fatal CHD, first nonfatal myocardial infarction, or first definite angina) was tracked during five person-years of follow-up. Optimism and emotional vitality were both associated with a modest but consistent reduced risk of incident CHD. The relationship was comparable for men and women and was maintained after controlling for cardiovascular risk factors, including ill-being. Neither health-related behaviors nor biological factors explained these associations.

Whitehall II Cohort: Predicting Coronary Heart Disease From Life Satisfaction (Boehm, Peterson, Kivimaki and Kubzansky, 2011b).

This study investigated whether satisfaction with specific life domains (e.g., job, family) predicted CHD. Incident CHD (i.e., angina, nonfatal myocardial infarction, or death from CHD) was ascertained in 7,956 initially healthy members of the Whitehall II cohort. Satisfaction averaged across domains was associated with reduced CHD risk controlling for demographic characteristics, health behaviors, blood pressure, and metabolic functioning. Associations with CHD risk were evident for satisfaction in four domains (job, family, sex life, and self), but not in three others (love relationship, leisure, and standard of living). When examining CHD outcomes separately, average domain satisfaction was associated with angina but not myocardial infarction (MI) or coronary death. These findings suggest that satisfaction with life may promote heart health. Further research should examine whether interventions to enhance life satisfaction in specific domains reduce CHD risk and whether life satisfaction

is primarily associated with atherosclerosis rather than thrombotic factors.

Normative Aging Study: Predicting Coronary Heart Disease From Self-Regulation (Kubzansky, Park, Peterson, Vokonas and Sparrow, 2011)

Studies have documented effects of positive and negative emotion on the risk of developing CHD. However, little work has directly assessed the role of self-regulation in risk of incident CHD. This paper sought to fill that gap. Participants were 1,122 community-dwelling men aged 40 to 90 years. The men were free from CHD and diabetes mellitus at baseline, and were followed up for an average of 12.7 years. During follow-up, 168 cases of incident CHD occurred, including 56 cases of incident nonfatal MI, 44 cases of fatal CHD, and 68 cases of angina pectoris. Men reporting higher levels of self-regulation had a reduced risk of combined nonfatal MI and CHD death compared to those with lower levels. Moreover, a dose-response relation was evident, as each standard deviation increase in self-regulation level was associated with a 20 percent decreased risk of combined angina, nonfatal MI, and CHD death. Significant associations were also found after adjusting for anxiety, anger, and depression and after controlling for positive affect. The association could not be explained by known demographic factors, health behaviors, or biological factors. Thus, self-regulation may protect against risk of CHD in older men.

Normative Aging Study: Predicting Inflammation From Optimism (Ikeda, Schwartz, Peters, Fang, Spiro, Sparrow, Vokonas and Kubzansky, 2011).

Optimism may reduce the risk of incident cardiovascular disease, but the mechanisms are unknown. This study examined the association between optimism with change in inflammation and endothelial function over time in men. Longitudinal data were obtained from the Normative Aging Study, excluding men with preexisting CHD or active infection at the time optimism was assessed (n = 340; mean age = 70.9 years). The Life Orientation Test was used to measure optimism, and serum markers were used to measure inflammation and endothelial dysfunction. Serum markers were obtained repeatedly during the course of the study, which was conducted from 1999 to 2008. These markers included high-sensitivity C-reactive

protein, interleukin 6, soluble intercellular adhesion molecule 1, soluble vascular cell adhesion molecule 1, and soluble tumor necrosis factor receptor II. A total of 243 men, or 71 percent, had two or more repeated measures of each outcome, resulting in a total of 746 observations for analysis. Linear mixed-effects models with a random subject intercept were used to estimate associations. Higher overall optimism scores were associated with lower levels of interleukin 6 and soluble intercellular adhesion molecule 1 pooled across multiple time points. However, optimism scores were not associated with rate of change in these markers over time. Thus, inflammation, associated with low optimism, may be a mechanism by which low optimism predisposes to CHD.

Health and Retirement Study: Predicting Stroke From Optimism (*Kim, Park and Peterson, 2011*)

Since 1992, the Health and Retirement Study has surveyed a representative sample of more than 22,000 Americans over the age of 50 every two years (National Institute on Aging, 2007). The HRS has collected information about income, work, assets, pension plans, health insurance, disability, physical health and functioning, cognitive functioning, and health care expenditures.

In this dataset, we examined whether higher optimism was associated with a lower incidence of stroke. Analyses were conducted for a two-year follow-up on the subset of 6,044 adults (2,542 men and 3,502 women) who were stroke-free at baseline. Analyses adjusted for chronic illnesses, self-rated health, and relevant socio-demographic, behavioral, biological, and psychological factors. Higher optimism was associated with a lower risk of stroke. On an optimism measure ranging from 3 to 18, each unit increase in optimism was associated with an age-adjusted odds ratio of 0.90 for stroke. The effect of optimism remained significant even after fully adjusting for a comprehensive set of socio-demographic, behavioral, biological, and psychological stroke risk factors.

Health and Retirement Study: Predicting Heart Attack From Purpose in Life (*Kim, Sun, Park, Kubzansky and Peterson, 2010*)

Again using the HRS, we investigated whether purpose in life predicted risk of subsequent heart attack among 1,546 participants with cardiovascular disease. Purpose

in life was assessed with a seven-item questionnaire adapted from Ryff's Psychological Well-Being Scales (Ryff, 1989; Ryff and Keyes, 1995). Higher levels of purpose were associated with a 79 percent reduced risk of heart attack in older adults two years after it was measured, even after controlling for psychological and biological risk factors and holding CVD severity constant.

ONGOING AND PLANNED STUDIES

All of our planned analyses are longitudinal unless otherwise stated.

A study of Positive Health assets assessed in early adulthood among the participants in the Harvard Grant Study and their association with CVD in later adulthood is ongoing (cf. Vaillant and Vaillant, 1990). In order to do these analyses, we went back to the original data archive and had medically trained coders identify instances of CVD and their onset.

Additional analyses with Whitehall II Cohort are ongoing, and we plan to examine the following relationships:

- Subjective assets and cardiovascular health, including hypertension and diabetes
- Subjective assets and biological assets (likely cross-sectional, as repeated measures of biological assets are not available)
- Subjective assets and health behaviors, including cigarette smoking, alcohol consumption, physical activity, and diet

Additional analyses with the Health and Retirement Study are planned to examine the following relationships:

- Subjective assets and changes in health behaviors, including cigarette smoking and physical activity
- Subjective assets and changes in biological assets, including body mass index, pulmonary function (poor function is a risk factor for CVD), and blood pressure or incident hypertension

Additional analyses with the Normative Aging Study are ongoing or planned to examine the following relationships:

- Optimism and telomere length
- Optimism and lipids

- Positive social relationships and inflammatory and hemostatic factors
- Positive social relationships and telomere length

New analyses are ongoing or planned with MIDUS data, a study of Midlife in the United States, which recently conducted a systematic investigation of biological indicators and has unusually comprehensive measures of subjective assets (Brim, Ryff and Kessler, 2004):

- Psychological assets and heart rate variability
- Psychological assets and ideal cardiovascular health
- Psychological assets and measures of immune, metabolic, and cardiovascular function
- Inter-relationships among biological, psychological, and functional assets
- Social distribution of subjective assets

DISCUSSION

We have described some of our work to date on Positive Health, which we define as well-being beyond the absence of illness and disability. Positive Health is the empirical study of health assets, or factors that produce Positive Health, and we have identified candidate health assets in three domains: biological, subjective, and functional. As part of our work, we have set in motion a significant program of research using existing longitudinal datasets to determine if candidate health assets indeed predict health and illness even when the known (conventional) risk factors are taken into account. We have focused on subjective health assets and cardiac health. Results strongly support the premise of our initiative.

Where do health behaviors fit within this vision of Positive Health? As conventionally defined, health behaviors (e.g., cigarette smoking, physical activity, healthy diet) are not conceptualized as health assets per se but rather as factors that may be motivated by subjective health assets and, in turn, may contribute to biological and functional health assets. It must also be noted that biological and functional health will influence health behaviors, and these, in turn, may affect subjective health assets. Thus, any model of Positive Health must consider health behaviors as critical potential mediators between health assets and Positive Health.

Healthy physiological systems are maintained by competing autoregulatory influences (Goldberger, 1996). Physiological systems may be best characterized by nonlinear dynamics, and optimal functioning is defined by greater variability in some systems (e.g., heart rate) but a more narrow range of responses in other systems (e.g., blood pressure) (Rozanski and Kubzansky, 2005). Both aging and medical illness can produce loss of complexity and reserve, altering the body's capacity for optimal physiologic functioning. Given this complexity, a simple universal model of optimal functioning is unlikely to be appropriate.

For example, one of the ideas we have considered is that there is some optimal level at which various systems function, with departures in either direction—too little or too much—a sign of pathology. In this model, some middle level is considered normal and healthy. There are a number of systems for which this holds true. Too much sleep or too little sleep both predict premature mortality. Too much or too little insulin production is a symptom of disease. The same is true for very low or very high body mass index. However, for other systems, moderate levels may not be the best route to or indicator of good health. Can our immune system be “too” robust? Can our vision be “too” good? Can we have too much aerobic fitness?

These are rarely asked empirical questions, and there are several possible answers. For example, in positive psychology, the question has been posed whether someone can be too happy (Oishi, Diener and Lucas, 2007). The answer depends on the outcome measured. If we look at success in school or work, the extremely happy do a little less well than the merely happy. (Those who are unhappy do poorly.) But if we look at success in social relationships, the relationship with happiness is strictly linear: one cannot be too happy.

THE FUTURE OF POSITIVE HEALTH

Attention to the positive tells us something about good health that an exclusive focus on the negative does not. The studies we have described, along with analogous studies by other research groups, suggest that Positive Health is a useful concept (e.g., Boyle, Barnes, Buchman and Bennett, 2009; Brown, Nesse, Vinokur and Smith, 2003; Cohen and Pressman, 2006; Danner, Snowdon and Friesen, 2001; Diener and Chan, 2011; Maruta, Colligan, Malinchoc and Offord, 2002;

Rasmussen, Scheier and Greenhouse, 2009). We have identified Positive Health assets—such as emotional vitality, optimism, self-regulation, and purpose in life—and found meaningful relationships with health outcomes over and beyond effects of traditional risk factors.

That said, we are disappointed with the quality of the existing datasets, given the purpose of our initiative. The existing longitudinal datasets we examined are strongly tilted toward what goes wrong in life, and even those few datasets containing measures of assets do not typically do so in a sufficiently rigorous fashion. Assets such as positive emotion, life satisfaction, optimism, and social connectedness are generally measured cursorily, and there are only a few such measures at a time, precluding conclusions about their relative importance or their interrelations. Moreover, although ongoing longitudinal studies seem more likely in their recent waves to include positive measures, these are often missing at baseline and at early waves, limiting the ability to predict target outcomes over time.

Relying solely on such existing data for building a science of Positive Health will not be enough. Ongoing longitudinal studies need to add reliable and valid measures of the components of Positive Health. In addition, new longitudinal studies explicitly focused on Positive Health must be started. These are daunting recommendations. Those who direct ongoing studies have their own goals, which rarely include Positive Health, and new studies are extremely expensive and difficult to mount.

However, a third possibility exists: identifying a longitudinal dataset that already includes psychometrically adequate baseline measures of Positive Health assets and that has the potential to include all of the target health outcomes of interest. Such a dataset is at hand.

Stay tuned.

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Seligman MEP, Steen TA, Park N and Peterson C. “Positive Psychology Progress: Empirical Validation of Interventions.” *American Psychologist*, 60(5): 410-421, 2005.

Taylor RB, Denham JR and Ureda JW. *Health Promotion: Principles and Clinical Applications*. Norwalk, CT: Appleton-Century-Crofts, 1982.

Vaillant GE and Vaillant CO. “Natural History of Male Psychological Health XII: A 45-Year Study of Predictors of Successful Aging at Age 65.” *American Journal of Psychiatry*, 147(1): 31-37, 1990.

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SECTION 3: Measuring Positive Health—Indicators and Assets

Positive Health is agnostic about what factors are health assets *a priori*. It seeks to determine which candidate health assets actually produce longer life, lower morbidity, lower health care utilization, better prognosis when illness does strike, and higher quality of life. It proceeds by looking longitudinally at the outcomes of candidate health assets, holding risk factors constant.

Individuals in a state of Positive Health should have optimal ability to respond adaptively to environmental change and challenge, whether physical, chemical, or psychosocial. Defining this concept precisely in terms of distinct, measurable criteria is difficult. In our initial step, we read the extensive literature and divided candidate health assets into three domains: biological, psychological, and social or functional.

I. BIOLOGICAL INDICATORS OF POSITIVE HEALTH

Some anatomical characteristics and physiological capacities foster the ability to adapt to environmental challenge and stress, thereby increasing disease resistance and longevity and retarding the aging process. Our emphasis is on the biological characteristics that are positive, specifiable attributes and are not simply the absence of negative laboratory abnormalities or of

manifest disease. Some may be defined dimensionally in reference to a statistical norm (e.g., more than two standard deviations from the mean), and some may be defined categorically as the presence or absence of a particular characteristic.

A. BIOLOGICAL MARKERS OF POSITIVE HEALTH

1. RAPID WOUND HEALING

Wounds and other injuries heal at different rates. The rapidity with which ostensibly similar wounds heal may be a sign of especially good health.

Singer AJ and Clark RAF. “Cutaneous Wound Healing.” *New England Journal of Medicine*, 341(10): 738-746, 1999.

2. EXCEPTIONALLY LOW BLOOD PRESSURE

High blood pressure is a risk factor for many medical disorders, especially cardiovascular disease. What about low blood pressure? Here the evidence is mixed, with some studies finding that extremely low blood pressure is associated with good health and others finding that it is not. The effect may depend on the presence or absence of other medical conditions. Still,

exceptionally low blood pressure deserves consideration as a candidate Positive Health candidate.

Wessely S, Nickson J and Cox B. “Symptoms of Low Blood Pressure: A Population Study.” *British Medical Journal*, 301(6748): 362–365, 1990.

Amarenco P, Goldstein LB, Callahan A, et al. “Baseline Blood Pressure, Low- and High-Density Lipoproteins, and Triglycerides and the Risk of Vascular Events in the Stroke Prevention by Aggressive Reduction in Cholesterol Levels (SPARCL) Trial.” *Atherosclerosis*, 204(2): 515–520, 2009.

3. HIGH HEART RATE VARIABILITY AND PARASYMPATHETIC TONE

Heart rate variability refers to the variation in the time interval between successive cardiac contractions. It is a strong predictor of good health, presumably because it reflects the speed with which the parasympathetic nervous system counteracts arousal—good in the short run but not when prolonged.

Bosquet L, Merkari S, Arvaisis D and Aubert AE. “Is Heart Rate a Convenient Tool to Monitor Over-reaching? A Systematic Review of the Literature.” *British Journal of Sports Medicine*, 42(9): 709–714, 2008.

Buccelletti E, Gilardi E, Scaini E, et al. “Heart Rate Variability and Myocardial Infarction: Systematic Literature Review and Meta-analysis.” *European Review Medical Pharmacological Science*, 13(4): 299–307, 2009.

De Meersman RE and Stein PK. “Vagal Modulation and Aging.” *Biological Psychology*, 74(2): 165–173, 2007.

Sandercock GR, Bromley PD and Brodie DA. “Effects of Exercise on Heart Rate Variability: Inferences From Meta-Analysis.” *Medical Science Sports and Exercise*, 37(3): 433–439, 2005.

Tak LM, Riese H, de Bock GH, et al. “As Good As It Gets? A Meta-Analysis and Systematic Review of Methodological Quality of Heart Rate Variability Studies in Functional Somatic Disorders.” *Biological Psychology*, 82(2): 101–110, 2009.

Tsuji H, Larson MG, Ferdinand JV, Manders ES, Evans JC, Feldman CL and Levy D. “Impact of Reduced Heart Rate Variability on Risk for Cardiac Events: The Framingham Heart Study.” *Circulation*, 94(11): 2850–2855, 1996.

4. HIGH HDL/LDL RATIO

HDL/LDL is the ratio of cholesterol carried by high-density lipoprotein to that carried by low-density lipoprotein and is a demonstrable health asset vis-à-

vis cardiovascular disease. Moreover, this ratio can be changed by dietary and exercise interventions. What is unknown is the limits of this relationship, i.e., does it remain true even for very high ratios?

Sallis JF, Patterson TL, Buono MJ and Nader PR. “Relationship of Cardiovascular Fitness and Physical to Cardiovascular Disease Risk Factors in Children and Adults.” *American Journal of Epidemiology*, 127(5): 933–941, 1988.

5. GREATER TELOMERE LENGTH FOR ONE’S AGE

Telomeres are repetitive DNA sequences at the end of chromosomes that protect the chromosome from the erosion that occurs with repeated cell division and aging. Telomere length is viewed as a marker of biological age that reflects the lifetime burden of genetic factors and environmental stressors. An association has been found between telomere length and cardiovascular morbidity and mortality, as well as a range of other degenerative diseases and cancer.

Calado RT and Young NS. “Telomere Diseases.” *New England Journal of Medicine*, 361: 2353–2365, 2009.

Cawthon R, Smith K, O’Brien E, Sivatchnko A and Kerber R. “Association Between Telomere Length in Blood and Mortality in People Aged 60 Years or Older.” *The Lancet*, 361(9355) 393–395, 2003.

6. LOW BODY MASS INDEX (BMI)

Body mass index is a ratio derived from an individual’s weight and height. Though not a direct measure of the percentage of body fat, it serves as an index of obesity and is a widely used diagnostic indicator of weight problems within a population.

High BMI is a known risk factor for morbidity and mortality. Less clear is whether an exceptionally low BMI is a health asset. Some studies suggest that it is, but others find a U-shaped relationship with poor health, perhaps because of unmeasured confounds. Low BMI thus deserves consideration as a candidate Positive Health aspect.

Allison DB, Faith MS, Heo M, Townsend-Butterworth D and Williamson DF. “Meta-Analysis of the Effect of Excluding Early Deaths on the Estimated Relationship Between Body Mass Index and Mortality.” *Obesity Research*, 7(4): 342–354, 1999.

7. VITAMIN D LEVEL

Low levels of vitamin D can result in thin, brittle, or misshapen bones; rickets in children; and osteomalacia in adults. Together with calcium, vitamin D helps protect against osteoporosis. Vitamin D also modulates neuromuscular function; reduces inflammation; and influences the action of many genes that regulate the proliferation, differentiation, and apoptosis of cells. Studies suggest that very high levels of vitamin D may be a Positive Health asset.

Autier P and Gandini S. “Vitamin D Supplementation and Total Mortality: A Meta-Analysis of Randomized Controlled Trials.” *Archives of Internal Medicine*, 167(16): 1730-1737, 2007.

8. NEUROPEPTIDE Y

Neuropeptide Y is a 36-amino acid peptide neurotransmitter found in the brain and autonomic nervous system. It is associated with a number of physiologic processes in the brain, including the regulation of energy balance, memory, and learning. Neuropeptide Y has been proposed as a “universal soldier” of well-being because of its presumed association with good health.

Pedrazzini T, Pralong F and Grouzmann E. “Neuropeptide Y: The Universal Soldier.” *Cellular and Molecular Life Sciences*, 60(2): 350-377, 2003.

9. OXYTOCIN

Oxytocin is a neurohormone that is associated with an array of prosocial behaviors, including interpersonal trust, attachment, and marital fidelity. Oxytocin surges during labor and is also increased by physical touch. Its association with morbidity and mortality is not clear, but given its prosocial consequences, it deserves attention as a candidate Positive Health asset.

Kosfeld M, Heinrichs M, Zak PJ, Fischbacher U and Gehr E. “Oxytocin Increases Trust in Humans.” *Nature*, 435: 673-676, 2005.

Uvnäs-Moberg K. “Oxytocin May Mediate the Benefits of Positive Social Interactions and Emotions.” *Psychoneuroendocrinology*, 23(8): 819-835, 1998.

10. MAXIMAL OXYGEN UPTAKE (VO₂ MAX)

VO₂ max (also termed maximal oxygen consumption or peak oxygen uptake) is a measure of aerobic capacity, or the ability to increase the delivery of oxygen to tissues and organs during exercise. It reflects the physical fitness of the individual and is a demonstrable health asset.

Blair SN, Kampert JB, Kohl HW, Barlow CE, Macera CA, Paffenbarger RS and Gibbons LW. “Influences of Cardiorespiratory Fitness and Other Precursors on Cardiovascular Disease and All-Cause Mortality in Men and Women.” *JAMA*, 276(3): 205-10, 1996.

11. LOW FIBRINOGEN

Fibrinogen is a fibrous protein involved in blood clotting. High levels of fibrinogen are a risk factor for cardiovascular disease. Accordingly, low levels may be a Positive Health asset.

Ernst E and Resh KL. “Fibrinogen as a Cardiovascular Risk Factor: A Meta-Analysis and Review of the Literature.” *Annals of Internal Medicine*, 118(12): 956-963, 1993.

Danesh J, Collins R, Appleby P and Peto R. “Association of Fibrinogen, C-Reactive Protein, Albumin, or Leukocyte Count With Coronary Heart Disease: Meta-Analyses of Prospective Studies.” *JAMA*, 279(18): 1477-1482, 1998.

B. PHYSIOLOGICAL RESERVES

Positive Health may also be described in terms of the physiological reserves of various organ systems that lead to biological resilience and successful adaptation to environmental challenges and stressors. The functional reserve of many organ systems can be measured with routine laboratory tests. In each case, we seek to determine if there is a linear relationship between increasing reserve and greater health—i.e., do individuals with exceptional reserves lead exceptionally long and healthy lives? These functional reserves include cardiovascular, pulmonary, renal, hepatic, and central nervous system reserves.

Thus, Positive Health may be defined statistically, as the outliers on the positive tails of such laboratory tests and physiological performance measures. Other manifestations of Positive Health might include delayed onset and slower progression of normal, age-related physiological decline in organ function, defined more

precisely as biological age that is markedly younger than chronological age.

1. CARDIOVASCULAR RESERVES

This refers to the cardiovascular system's ability to respond to physiological demands with increased rate and force of cardiac contraction. It is routinely measured with a standardized exercise tolerance or stress test.

Gordon DJ, Ekellund LG, Karon JM, Probstfield JL, Rubinstein C, Sheffield LT and Weissfeld L. "Predictive Value of the Exercise Tolerance Test for Mortality in North American Men: The Lipid Research Clinics Mortality Follow-Up Study." *Circulation*, 74(2): 252-261, 1986.

2. PULMONARY RESERVES

This term refers to the extent of one's ability to increase respiratory rate and volume above those at rest. It is routinely measured with standardized pulmonary function tests.

Beatty TH, Newill CA, Cohen BH, Tockman MS, Bryant SH and Spurgeon HA. "Effects of Pulmonary Function on Mortality." *Journal of Chronic Diseases*, 38(8): 703-710, 1985.

3. RENAL RESERVES

This refers to the efficiency and completeness with which the kidneys are able to filter toxic wastes and metabolic byproducts from the blood. It is routinely assessed by measuring the level of urea nitrogen and creatinine in the blood.

Gibson CM et al. "Association of Creatinine and Creatinine Clearance on Presentation in Acute Myocardial Infarction With Subsequent Mortality." *Journal of the American College of Cardiology*, 42(9): 1535-1543, 2003.

4. HEPATIC RESERVES

Liver function is routinely measured by obtaining the blood level of several liver enzymes.

Batin P, Wickens M, McEntegart D, Fullwood L and Cowley AJ. "Expand+The Importance of Abnormalities of Liver Function Tests in Predicting Mortality in Chronic Heart Failure." *European Heart Journal*, 16(11): 1613-1618, 1995.

5. CENTRAL NERVOUS SYSTEM RESERVES

This is measured through tests of coordination, memory, and balance.

Liu IY, Lacroix AZ, White LR, Kittner SJ and Wolf PA. "Cognitive Impairment and Mortality: A Study of Possible Confounders." *American Journal of Epidemiology*, 132(1): 136-143, 1

C. RECUPERATIVE ABILITY

Because sickness is an inextricable part of life itself and disease is a universal phenomenon, Positive Health may not depend solely on the absence of disease but may rather include the capacity of the body to respond to the diseases that inevitably occur from time to time. Thus, we could define positive biological health not as the absence of all disease but rather by the response to disease—as the ability to recover from disease rapidly, completely, and with an unusually benign course. In each of the examples below, we would assess the course of recovery among individuals with a comparable extent and severity of injury or disease, seeking to identify and study those statistical outliers who recover exceptionally rapidly and without sequelae.

1. LESS FREQUENT AND BRIEFER SELF-LIMITED AILMENTS AND INFECTIONS (E.G., COLDS, HEADACHES, GASTROENTERITIS)

Cohen S, Alper CM, Doyle WJ, Treanor JJ and Turner RB. "Positive Emotional Style Predicts Resistance to Illness After Experimental Exposure to Rhinovirus or Influenza A Virus." *Psychosomatic Medicine*, 68(6): 809-815, 2006.

2. RAPID RECOVERY FROM INJURY

Reifman A. "Social Relationships, Recovery From Illness, and Survival: A Literature Review." *Annals of Behavioral Medicine*, 17(2): 124-131, 1995.

3. NO RECURRENCE FOLLOWING SUCCESSFUL TREATMENT OF A PRIMARY CANCER

Eilber FR and Morton DL. "Impaired Immunologic Reactivity and Recurrence Following Cancer Surgery." *Cancer*, 25(2): 362-367, 2006.

4. CHRONIC DISEASES (E.G., EMPHYSEMA OR ARTHRITIS) WITH EXCEPTIONALLY BENIGN COURSES, COMPLETE RECOVERIES, AND/OR LONG LIVES

Murray C and Lopez A. “Regional Patterns of Disability-Free Life Expectancy and Disability-Adjusted Life Expectancy: Global Burden of Disease Study.” *The Lancet*, 349(9062): 1347-1352, 1997.

II. SUBJECTIVE INDICATORS OF POSITIVE HEALTH

Various psychological characteristics—states or traits—usually assessed by self-report are likely Positive Health candidates given research that has linked them to lower rates of morbidity and mortality. Further investigation of these relationships is essential, in particular to establish whether the relationship between psychological characteristics and physical health is a direct physiological one or whether it is mediated through health- and illness-related behaviors. Here are some examples of candidate psychological variables that have been linked in previous research to good psychological and/or physical health:

1. ZEST

Zest is the overall enthusiasm with which a person lives. Also identified as energy, liveliness, exuberance, or *joie de vivre*, zest has also been discussed in the organizational behavior literature as work-specific vigor and work-specific engagement. Zest is one of the strengths of character included in the VIA Classification of Character Strengths, where it is defined as the habitual approach to life with anticipation, energy, and excitement (Peterson and Seligman, 2004). Zest is typically measured with self-report surveys and proves to be a robust correlate and predictor of life satisfaction and in particular work satisfaction.

Park N, Peterson C and Seligman MEP. “Strengths of Character and Well-Being.” *Journal of Social and Clinical Psychology*, 23(5): 603-619, 2004.

Peterson C, Park N, Hall N and Seligman MEP. “Zest and Work.” *Journal of Organizational Behavior*, 30(2): 161-172, 2009.

Peterson C and Seligman MEP. *Character Strengths and Virtues: A Handbook and Classification*. New York: Oxford

University Press/Washington, DC: American Psychological Association, 2004.

Ryan RM and Frederick C. “On Energy, Personality, and Health: Subjective Vitality as a Dynamic Reflection of Well-Being.” *Journal of Personality*, 65(3): 529-565, 1997.

2. ABSENCE OF BOTHERSOME SYMPTOMS

Part of “feeling” good includes the absence of, or few, bothersome or distressing physical symptoms. This health asset is necessary but not sufficient to assure physical well-being and satisfaction with one’s health. This subjective component of Positive Health can be assessed with one of a number of valid and reliable somatic symptom inventories, such as the Somatic Symptom Inventory or the Patient Health Questionnaire. These instruments ask the respondent about things such as fatigue, pain, nausea, and dizziness. These items are then reverse-scored. Along these lines, one could choose “symptom” items from the Hassles Scale and ask respondents the degree to which these symptoms are a source of ongoing disturbance and annoyance, again reverse-scoring the responses (cf. Kanner, Coyne, Schaefer and Lazarus, 1981).

Barsky AJ, Goodson JD, Lane RS and Cleary PD. “The Amplification of Somatic Symptoms.” *Psychosomatic Medicine*, 50(5): 510-519, 1988.

Kanner AD, Coyne JC, Schaefer C and Lazarus RS. “Comparison of Two Modes of Stress Measurement: Daily Hassles and Uplifts Versus Major Life Events.” *Journal of Behavioral Medicine*, 4(1): 1-39, 1981.

Kroenke K, Spitzer RL and Williams JBW. “The PHQ-15: Validity of a New Measure for Evaluating the Severity of Somatic Symptoms.” *Psychosomatic Medicine*, 64(2): 258-266, 2002.

3. OPTIMISM/HOPE

Optimism is the expectation that good events will be plentiful in the future and bad events rare. Optimism has been studied extensively by psychologists under several different rubrics: dispositional optimism (Carver and Scheier, 1981), hope (Snyder, 2000), and explanatory style (Peterson and Seligman, 1984). Optimism can be measured with self-report surveys, content analyses of open-ended material, or reconfigured personality inventories like the Minnesota Multiphasic Personality Inventory. However it is measured, optimism is associated with better health and longer life (Peterson, 2000; Peterson and Bossio, 1991).

Hope is also one of the strengths of character included in the VIA Classification of Character Strengths and one of the most robust predictors of happiness and life satisfaction for children, adolescents, and adults (Peterson and Seligman, 2004). Zest is typically measured with self-report surveys and proves to be a robust correlate and predictor of life satisfaction, particularly work satisfaction.

Carver CS and Scheier MF. *Attention and Self-Regulation: A Control-Theory Approach to Human Behavior*. New York: Springer-Verlag, 1981.

Peterson C. "The Future of Optimism." *American Psychologist*, 55(1): 44-55, 2000.

Peterson C and Bossio LM. *Health and Optimism*. New York: Free Press, 1991.

Peterson C and Seligman MEP. "Causal Explanations as a Risk Factor for Depression: Theory and Evidence." *Psychological Review*, 91(3): 347-374, 1984.

Peterson C and Seligman MEP. *Character Strengths and Virtues: A Handbook and Classification*. New York: Oxford University Press/Washington, DC: American Psychological Association, 2004.

Snyder CR (ed). *Handbook of Hope: Theory, Measures, and Applications*. San Diego: Academic Press, 2000.

4. HARDINESS

Kobasa (1979) described a personality dimension she labeled hardiness: the ability to find meaning and challenge in the demands of life. In a series of studies in which hardiness was measured with a self-report survey, hardy individuals were less likely than others to fall ill when confronted with stressful events.

Hardiness is sometimes used as a synonym for resiliency, the quality that allows some people to survive adversity or even to flourish in its wake (Luthar, Cicchetti and Becker, 2000). There is no consensus on how to measure resiliency, or indeed what its components may be, and one perspective holds simply that resilience should be ascertained after the fact of adversity by simply seeing who returns to baseline functioning and how quickly (Bonanno, 2004).

Bonanno GA. "Loss, Trauma, and Human Resilience: Have We Underestimated the Human Capacity to Thrive After Extremely Aversive Events?" *American Psychologist*, 59(1): 20-28, 2004.

Kobasa SC. "Stressful Life Events, Personality, and Health: An Inquiry Into Hardiness." *Journal of Personality and Social Psychology*, 37(1): 1-11, 1979.

Luthar SS, Cicchetti D and Becker B. "The Construct of Resilience: A Critical Evaluation and Guidelines for Future Work." *Child Development*, 71(3): 543-562, 2000.

5. INTERNAL HEALTH LOCUS OF CONTROL

Locus of control refers to people's generalized expectations about the source of events and outcomes in their lives (Rotter, 1966, 1975). The typical distinction is between an internal locus of control and an external locus of control, although external locus of control is sometimes divided between chance and powerful others (Levenson, 1973). An internal locus of control is associated with problem-focused coping and—to the degree that problems indeed have solutions—with success, including better psychological and physical health.

Health-related locus of control is a more specific instance of locus of control as it applies to one's physical health and encompasses the sense of control over one's medical outcomes and health (Wallston, 2005).

Levenson H. "Multidimensional Locus of Control in Psychiatric Patients." *Journal of Consulting and Clinical Psychology*, 41(3): 397-404, 1973.

Rotter JB. "Generalized Expectancies for Internal Versus External Control of Reinforcement." *Psychological Monographs*, 80(1), whole no. 609, 1966.

Rotter JB. "Some Problems and Misconceptions Related to the Construct of Internal Versus External Reinforcement." *Journal of Consulting and Clinical Psychology*, 43: 56-67, 1975.

Wallson, KA. (2005). The validity of the multidimensional health locus of control scales. *Journal of Health Psychology*, 10, 623-631.

Wallston BS and Wallston KA. "Locus of Control and Health: A Review of the Literature." *Health Education Monographs*, 6(2): 107-117, 1978.

Wallston KA, Wallston BS and DeVellis R. "Development of the Multidimensional Health Locus of Control (MHLC) Scales." *Health Education Monographs*, 6(2): 160-170, 1978.

Wallston BS, Wallston KA, Kaplan GD and Maides SA. "The Development and Validation of the Health Related Locus of Control (HLC) Scale." *Journal of Consulting and Clinical Psychology*, 44: 580-585, 1976.

6. LIFE SATISFACTION

Life satisfaction is the judgment that, overall, one's life is a good one (Diener, 1984, 1994, 2000). It is measured with a brief self-report scale that is reliable, stable, and has a large array of sensible correlates and consequences, including physical health.

Diener E. "Subjective Well-Being." *Psychological Bulletin*, 95: 542-575, 1984.

Diener E. "Assessing Subjective Well-Being: Progress and Opportunities." *Social Indicators Research*, 31(2): 103-157, 1994.

Diener E. "Subjective Well-Being: The Science of Happiness and a Proposal for a National Index." *American Psychologist*, 55(1): 34-43, 2000.

Diener E, Emmons RA, Larsen RJ and Griffin S. "The Satisfaction With Life Scale." *Journal of Personality Assessment*, 49(1): 71-75, 1985.

Lyubomirsky S, King LA and Diener E. "The Benefits of Frequent Positive Affect: Does Happiness Lead to Success?" *Psychological Bulletin*, 131(6): 803-855, 2005.

7. POSITIVE EMOTION/POSITIVE AFFECTIVITY/HEDONIC CAPACITY

The tendency to experience frequent positive emotions and feelings (e.g., joy, interest, and alertness) has been termed *hedonic capacity* (Meehl, 1975) and more recently *positive affectivity*—the extent to which an individual experiences positive moods (Watson, 2002).

Positive and negative emotions are typically measured with a self-report questionnaire called the PANAS (Positive and Negative Affect Schedule) (Watson, Clark and Tellegen, 1988). Respondents are presented with words describing positive moods (e.g., "inspired") and negative moods (e.g., "ashamed"), and asked to rate each according to the extent that it describes them. Instructions vary. For example, the questionnaire may ask for a rating right now, over the past few days, or simply in general. Regardless, the ratings are averaged separately across the positive mood words and across the negative mood words. Positive emotions so calculated are usually independent of negative emotions. Both prove highly stable across years and even decades.

Positive affectivity is more likely to be observed among extraverted individuals, equally so among men and women. People high in positive affectivity are socially active, have more friends and acquaintances, and

are more involved in social organizations. Negative affectivity is unrelated to these indicators of social behavior. People high in positive affectivity are more likely than those who are low to be married—especially happily—and to like their jobs. People who describe themselves as religious or spiritual score especially high on positive affectivity.

Meehl PE. "Hedonic Capacity: Some Conjectures." *Bulletin of the Menninger Clinic*, 39: 295-307, 1975.

Watson D. "Positive Affectivity: The Disposition to Experience Pleasurable Emotional States," pp. 106-119. In *Handbook of Positive Psychology*, Snyder CR and Lopez SJ (eds). New York: Oxford University Press, 2002.

Watson D, Clark LA and Tellegen A. "Development and Validation of Brief Measures of Positive and Negative Affect: The PANAS Scales." *Journal of Personality and Social Psychology*, 54(6): 1063-1070, 1988.

8. LOW NEGATIVE EMOTION

See above.

9. SUBJECTIVE WELL-BEING

Subjective well-being is usually defined as a composite: (a) relatively high levels of positive emotion, (b) relatively low levels of negative emotion, and (c) life satisfaction.

See above.

10. ENGAGEMENT

Engagement in the business of life shows itself as passion, commitment, perseverance, and the sense that one has been called to do what one does (Vallerand, 2008; Wrzesniewski, McCauley, Rozin and Schwartz, 1997). Engagement predicts life satisfaction.

Engagement overlaps with zest (see above). One of the mechanisms producing engagement may be the habitual experience of the psychological state of *flow* (Csikszentmihalyi, 1990). Flow occurs when there is an optimal balance between skill and challenge. During flow, time passes quickly for the engaged individual. Attention is focused on the activity itself, and the sense of the self as a social actor is lost. The aftermath of the flow experience is invigorating, and people describe flow as highly and intrinsically enjoyable.

Csikszentmihalyi M. *Flow: The Psychology of Optimal Experience*. New York: Harper and Row, 1990.

Vallerand RJ. "On the Psychology of Passion: In Search of What Makes People's Lives Most Worth Living." *Canadian Psychology*, 49: 1-13, 2008.

Wrzesniewski A, McCauley CR, Rozin P and Schwartz B. "Jobs, Careers, and Callings: People's Relations to Their Work." *Journal of Research in Personality*, 31(1): 21-33, 1997.

11. MEANING

Peterson, Park, and Seligman (2005) defined a meaningful life as one in which people feel connected to something larger than themselves. "Meaning" is usually assessed through interviews or self-report surveys, under the assumption that a meaningful life is best understood from the vantage of the individual who is living it. Sometimes the search for meaning is distinguished from the presence of meaning (Steger, Frazier and Oishi, 2006).

Research consistently links the presence of meaning to well-being. Individuals with a sense of purpose and meaning report greater life satisfaction, more positive affect, higher levels of optimism, and better self-esteem. They are less likely to have psychological problems. They also lead longer lives (e.g., Sone et al., 2008).

Research shows that a life framed by meaning is more satisfying than a life centered on pleasure. The age-old debate within philosophy between eudaimonia (living a life of meaning in accordance with inner virtue) and hedonism (seeking pleasure) has an empirical resolution. Eudaimonia trumps hedonism. This finding is important because so many of psychology's dominant perspectives—e.g., behaviorism and psychoanalysis—assume that hedonism is the fundamental principle underlying human conduct.

Peterson C, Park N and Seligman MEP. "Orientations to Happiness and Life Satisfaction: The Full Life Versus the Empty Life." *Journal of Happiness Studies*, 6: 25-41, 2005.

Sone T et al. "Sense of Life Worth Living (*ikigai*) and Mortality in Japan: Ohsaki Study." *Psychosomatic Medicine*, 70(6): 709-715, 2008.

Steger MF, Frazier P and Oishi S. "The Meaning in Life Questionnaire: Assessing the Presence of and Search for Meaning in Life." *Journal of Counseling Psychology*, 53(1): 80-93, 2006.

12. VITALITY

Vitality has been identified as a key component in a model of healthy psychological functioning (Rozanski and Kubzansky, 2005). This model highlights the importance of flexibility and identifies three interrelated components of healthy psychological functioning: vitality, coping flexibility (the ability to adjust and implement effective coping strategies according to the nature of the problem), and emotional flexibility (the ability to flexibly regulate emotion across a wide range of situations). According to this model, vitality is a composite of positive emotions that provides energy for managing negative emotions and solving problems effectively. This relationship is proposed to be bidirectional, with effective emotional regulatory processes and coping skills also helping to preserve vitality by diminishing the frequency of energy-depleting negative emotions and/or taxing life problems.

A number of measures of vitality exist (all self-report via questionnaires), and they vary widely, from measuring primarily physical levels of energy to capturing more psychological aspects of feeling alive and engaged. Two recent measures of vitality have been linked to health outcomes, specifically cardiovascular outcomes (Kubzansky and Thurston, 2007; Richman, Kubzansky, Maselko, Ackerson and Bauer, in press). These include psychological vitality, defined as representing a combination of hopefulness and mental vigor (i.e., interest); and emotional vitality, defined as a sense of positive energy, the ability to effectively regulate emotion and behavior, and positive well-being, which includes feeling engaged and interested in life and measured using items from the General Well-Being Schedule.

Kubzansky LD and Thurston RC. "Emotional Vitality and Incident Coronary Heart Disease: Benefits of Healthy Psychological Functioning." *Archives of General Psychiatry*, 64(12): 1393-1401, 2007.

Richman LS, Kubzansky LD, Maselko J, Kawachi I, Choo P and Bauer M. "Positive Emotion and Health: Going Beyond the Negative." *Health Psychology*, 24(4): 422-429, 2005.

Richman LS, Kubzansky LD, Maselko J, Ackerson LK and Bauer M. "The Relationship Between Vitality and Cardiovascular Health." *Psychology and Health* (in press).

Rozanski A and Kubzansky LD. “Psychologic Functioning and Physical Health: A Paradigm of Flexibility.” *Psychosomatic Medicine*, 67 (Suppl. 1): S47-53, 2005.

Ryan RM and Frederick C. “On Energy, Personality, and Health: Subjective Vitality as a Dynamic Reflection of Well-Being.” *Journal of Personality*, 65(3): 529-565, 1997.

13. CURIOSITY

Curiosity has been defined as an affective state (or trait)—closely linked to interest—that is related to wanting to investigate, learn, and incorporate new experiences. It may overlap with both engagement and zest, defined above. More cognitively oriented theorists have suggested that curiosity is characterized by a set of hypothetical mechanisms that serve to orient or attract an organism to novel stimuli (Swan and Carmelli, 1996).

There are some suggestions of links between curiosity and health. In one prospective study, Swan and Carmelli (1996) found a relationship between curiosity in older men and women and subsequent survival over a five-year period. Older adults who were more curious were at 30 percent decreased risk of dying during the study period, relative to less curious adults. Other research has suggested that older adults who display curious engagement with their environment through hobbies or other activities live longer and are less likely to develop degenerative diseases of the central nervous system (Silvia, 2001). In a study using data abstracted from patient records obtained from a multispecialty, multigroup medical practice over a two-year period, higher levels of curiosity were associated with decreased likelihood of incident hypertension and prevalent diabetes mellitus (Richman et al., 2005).

Measures of curiosity are usually self-report questionnaire-based and primarily capture the extent to which individuals are engaged in their social environment and willing to explore novel stimuli.

Richman L, Kubzansky LD, Maselko J, Kawachi I, Choo P and Bauer M. “Positive Emotion and Health: Going Beyond the Negative.” *Health Psychology*, 24(4): 422-429, 2005.

Silvia PJ. “Interest and Interests: The Psychology of Constructive Capriciousness.” *Review of General Psychology*, 5: 270-290, 2001.

Spielberger CD. *Preliminary Manual for the State-Trait Personality Inventory*. Tampa, FL: University of South Florida, 1998.

Swan GE and Carmelli D. “Curiosity and Mortality in Aging Adults: A 5-year Follow-Up of the Western Collaborative Group Study.” *Psychology and Aging*, 11(3): 449-453, 1996.

14. MASTERY/SENSE OF CONTROL

Belief in personal control is a learned expectation that outcomes are contingent on one’s own choices and actions and that one can master or effectively alter one’s environment (Ross and Wu, 1995; Seeman and Seeman, 1983). A greater sense of control has been linked to more Positive Health outcomes (Kessler, Turner and House, 1988; Mirowsky and Ross, 1990; Rodin, 1986; Turner and Noh, 1983; Turner and Roszell, 1994). A sense of control may influence health, both through enhancing health-related behaviors and through physiological mechanisms that are triggered by experiences of uncontrollability and demoralization (Rodin and Timko, 1992; Rowe and Kahn, 1987; Seeman and Seeman, 1983).

Generalized control has been measured using self-report, with multiple items reflecting two dimensions: personal mastery and perceived constraints (Lachman and Weaver, 1998). Personal mastery refers to one’s sense of efficacy or effectiveness in carrying out goals. Perceived constraints indicate to what extent one believes there are obstacles or factors beyond one’s control that interfere with reaching goals. These dimensions are consistent with Skinner’s (1996) two-fold conceptualization of control as comprised of competence and contingency.

Kessler RC, Turner JB and House JS. “Effects of Unemployment on Health in a Community Survey: Main, Modifying, and Mediating Effects.” *Journal of Social Issues*, 44(4): 69-85, 1988.

Lerner D, Levine S, Malspeis S and D’Agostino RB. “Job Strain and Health-Related Quality of Life in a National Sample.” *American Journal of Public Health*, 84(10): 1580-1585, 1994.

Mirowsky J and Ross CE. “Control or Defense? Depression and the Sense of Control Over Good and Bad Outcomes.” *Journal of Health and Social Behavior*, 31(1): 71-86, 1990.

Rodin J. “Aging and Health: Effects of the Sense of Control.” *Science*, 233(4770): 1271-1276, 1986.

Rodin J and Timko C. “Sense of Control, Aging, Health.” In *Aging, Health, and Behavior*, Ory MG, Abeles RP and Lipman PD (eds), pp. 207-236. Newbury Park, CA: Sage, 1992.

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Rowe JW and Kahn RL. "Human Aging: Usual and Successful." *Science*, 237(4811): 143-149, 1987.

Seeman M and Seeman TE. "Health Behavior and Personal Autonomy: A Longitudinal Study of the Sense of Control in Illness." *Journal of Health and Social Behavior*, 24(2): 144-160, 1983.

Turner RJ and Noh S. "Class and Psychological Vulnerability Among Women: The Significance of Social Support and Personal Control." *Journal of Health and Social Behavior*, 24(1): 2-15, 1983.

Turner RJ and Roszell P. "Psychosocial Resources and the Stress Process." In *Stress and Mental Health: Contemporary Issues and Prospects for the Future*, Avison WR and Gotlib IH (eds), pp. 179-210. New York: Plenum, 1994.

15. SENSE OF COHERENCE

Sense of coherence (SOC) is hypothesized as a flexible and adaptive dispositional orientation that enables successful coping with adverse experience. It has been shown to be associated with perceived good health and predictive of Positive Health outcomes (Surtees, Wainwright, Luben, Khaw and Day, 2006; Wainwright et al., 2008). Individuals with a strong SOC appear to be more resilient to the negative effects of social stress. The construct was proposed by Antonovsky (1979) and is measured using self-report items.

Antonovsky tried to find the solution to the salutogenic question of why some people, regardless of major stressful situations and severe hardships, stay healthy, while others do not. How do people manage their inability to control their life? The answer was formulated in terms of SOC and general resistance resources (GRRs). The SOC refers to an enduring attitude and measures how people view life and identify and use their GRRs in stressful situations to maintain and develop their health. The SOC consists of at least three dimensions: comprehensibility, manageability, and meaningfulness.

Antonovsky A. *Health, Stress, and Coping*. San Francisco: Jossey-Bass, 1979.

Surtees PG, Wainwright NW, Luben R, Khaw KT and Day NE. "Mastery, Sense of Coherence, and Mortality: Evidence of Independent Associations From the EPIC-Norfolk Prospective Cohort Study." *Health Psychology*, 25(1): 102-110, 2006.

Wainwright NW, Surtees PG, Welch AA, Luben RN, Khaw KT and Bingham SA. "Sense of Coherence, Lifestyle Choices and Mortality." *Journal of Epidemiology and Community Health*, 62(9): 829-831, 2008.

16. SUBJECTIVE SENSE OF OVERALL PHYSICAL WELL-BEING

This dimension of physical well-being extends beyond the absence of distressing somatic symptoms and demonstrable disease to encompass a conscious sense of satisfaction with and enjoyment of one's healthy body. The perception of good health may diverge to some extent from objective health status. Because the subjective experience of one's health and objective measures of medical morbidity are only moderately intercorrelated, it is possible that some medically ill individuals may nonetheless experience a sense of good health, satisfaction, or contentment with their status.

The subjective experience of Positive Health encompasses at least three closely related but distinct dimensions.

(A) *An overall sense of physical well-being and global satisfaction with one's health and physical capacities*

Although associated with objective medical morbidity, physical well-being is also subject to broad psychosocial forces. Self-rated global health is often measured with the single item: "In general, how would you rate your health compared to others of your age and sex?" This rating consistently predicts subsequent mortality, morbidity, and illness course, even after controlling for objective measurements of medical status.

Idler EL and Benyamini Y. "Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies." *Journal of Health and Social Behavior*, 38(1): 21-37, 1997.

Eriksson I, Unden AL and Elofsson S. "Self-Rated Health. Comparisons Between Three Different Measures. Results From a Population Study." *International Journal of Epidemiology*, 30(2): 326-333, 2001.

Shadbolt B, Barresi J and Craft P. "Self-Rated Health as a Predictor of Survival Among Patients With Advanced Cancer." *Journal of Clinical Oncology*, 20(10): 2514-2519, 2002.

Flykesnes K and Forde OH. "Determinants and Dimensions Involved in Self-Evaluation of Health." *Social Science and Medicine*, 35(3): 271-279, 1991.

Mondloch MV, Cole DC and Frank JW. "Does How You Do Depend on How You Think You'll Do? A Systematic

Review of the Evidence for a Relation Between Patients' Recovery Expectations and Health Outcomes." *Canadian Medical Association Journal*, 165(10): 174-179, 2001.

(B) *A positive appreciation and sense of satisfaction and pleasure in one's physical capacities*

These include the subjective experience of vigor, vitality, stamina, and energy ("full of pep"), as well as feeling strong, robust, hale, and hearty. A number of self-report questionnaires contain individual items and subscales assessing vitality, several of which have been associated with health outcomes. See discussion above.

(C) *A sense of physical security*

Physical well-being includes a sense of sturdiness, durability, ruggedness, and hardiness, as opposed to a sense of fragility and frailty, and susceptibility to infirmity and disease. Hardiness has been assessed with self-report surveys, but the development of a version that focuses more narrowly and more specifically on physical health would be desirable.

This dimension is opposed to disease fears and illness worries, health-related anxiety, intolerance of uncertainty, and exceptionally intense fear of death. Health-related anxiety can be assessed with the Health Anxiety Questionnaire or with the Whiteley Index, and uncertainty intolerance has been assessed with the Intolerance of Uncertainty Scale.

Buhr K and Dugas MJ. "The Intolerance of Uncertainty Scale: Psychometric Properties of the English Version." *Behaviour Research and Therapy*, 40(8): 931-945, 2002.

Lucock MP and Morley S. "The Health Anxiety Questionnaire." *British Journal of Health Psychology*, 1(2): 137-150, 1996.

Pilowsky I. "Dimensions of Hypochondriasis." *The British Journal of Psychiatry*, 113: 89-93, 1967.

III. FUNCTIONAL INDICATORS OF POSITIVE HEALTH

The concept of Positive Health implies optimal physical functioning and optimal role functioning, above and beyond the mere absence of role impairment or demonstrable physical disability. In other words, the ability to engage in whatever physical activities one wishes to without restrictions or impediments is an indicator of Positive Health. There are two classes

of functional indicators: physical function—the individual's physical capacities and abilities—and role function—the ability to carry out one's occupational, social, and family roles. A third class of indicators pertains to the individual's social integration and support received from others.

A. POSITIVE PHYSICAL FUNCTIONING

1. EXCEPTIONAL SENSORY ACUITY (E.G., VISION, TASTE, HEARING)

Meilgaard MC, Civille GV and Carr BT. *Sensory Evaluation Techniques* (4th ed.). Boca Raton, FL: Taylor and Francis, 2007.

2. EXCEPTIONAL MOTOR PERFORMANCE AND MUSCULOSKELETAL FUNCTION (E.G., RANGE OF MOTION, STRENGTH, ENDURANCE, FLEXIBILITY, FINE MOTOR SKILLS)

Allard F and Starkes JL. "Motor-Skill Experts in Sports, Dance, and Other Domains." In *Toward a General Theory of Expertise: Prospects and Limits*, Ericsson EA and Smith J (eds), pp. 126-152. New York: Cambridge University Press, 1991.

3. EXCEPTIONAL CENTRAL NERVOUS SYSTEM FUNCTION (E.G., BALANCE, COORDINATION, COGNITION, MEMORY)

Gardner H. *Frames of Mind: The Theory of Multiple Intelligences*. New York: Basic Books, 1983.

de Groot AD and Gobet F. *Perception and Memory in Chess: Studies in the Heuristics of the Professional Eye*. Assen: Van Gorcum, 1996.

B. POSITIVE ROLE FUNCTION

Positive role function refers to personal ecology—"person-environment fit"—and is characterized not only by the biomedical characteristics of the individual but also by the degree of success of the match between the individual's physical abilities and the requirements of the environment and their chosen lifestyle. The extent of the adaptation between the individual's physical capacities and the demands of their circumstances and lifestyle is thus an indicator of Positive Health. This encompasses function: occupation, family roles, social and community activities, avocations, and recreational activities.

In theory, two individuals with the same disease could differ in their Positive Health status. For example, the paralyzed mathematician may be better adapted to his disease and, therefore, healthier than the paralyzed athlete.

As an extension of this point, positive functional health might also encompass the ability to tolerate, adapt to, and cope successfully with omnipresent sources of physical distress or impairment that are not clearly thought of as diseases per se. These include myopia, short stature, insomnia, speech impediments, injuries, disturbances of menstruation and menopause, and the normal concomitants of aging (e.g., decreased night vision, diminished hearing, decreased strength, dental problems). The state of positive functional health may encompass the ability to adjust to and accommodate these states without attributing them to ill health and without experiencing them as impediments or handicaps.

Cohen S. "Social Relationships and Health." *American Psychologist*, 59(8): 676-684, 2004.

Cohen S, Underwood L and Gottlieb BH. *Social Support Measurement and Intervention: A Guide for Health and Social Scientists*. New York: Oxford University Press, 2000.

Hendrick SS. "Relationship Assessment Scale: A Generic Measure of Relationship Satisfaction." *Journal of Marriage and the Family*, 50: 93-98, 1988.

Russell D, Peplau LA and Cutrona CE. "The Revised UCLA Loneliness Scale: Concurrent and Discriminant Validity Evidence." *Journal of Personality and Social Psychology*, 39(3): 472-480, 1980.

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Wrzesniewski A, McCauley CR, Rozin P and Schwartz B. "Jobs, Careers, and Callings: People's Relations to Their Work." *Journal of Research in Personality*, 31(1): 21-33, 1997.

Zimet GD, Dahlem NW, Zimet SG and Farley GK. "The Multidimensional Scale of Perceived Social Support." *Journal of Personality Assessment*, 52(1): 30-41, 1988.

Zimet GD, Powell SS, Farley GK, Werkman S and Berkoff KA. "Psychometric Characteristics of the Multidimensional

Scale of Perceived Social Support." *Journal of Personality Assessment*, 55(3-4): 610-17, 1990.

Iwarsson I, Horstmann V, Carlsson G, Oswald F and Wahl HW. "Person-Environment Fit Predicts Falls in Older Adults Better Than the Consideration of Environmental Hazards Only." *Clinical Rehabilitation*, 23(6): 558-567, 2009.

Mechanic D. "The Concept of Illness Behaviour: Culture, Situation and Personal Predisposition." *Psychological Medicine*, 16(1): 1-7, 1986.

C. POSITIVE SOCIAL INTEGRATION AND SUPPORT

Numerous prospective studies have established that social integration is a predictor of Positive Health and physical well-being. The quality and quantity of one's marriage and social relationships, perceived social support from others, and membership in a diverse social network, all lead to greater longevity, less cognitive decline with aging, greater resistance to infectious disease, improved outcomes with serious disease, and lower mortality rates from a variety of causes. Many validated and reliable scales have been developed to assess these domains.

Berkman LF, Leo-Summers L and Horwitz RI. "Emotional Support and Survival After Myocardial Infarction: A Prospective, Population-Based Study of the Elderly." *Annals of Internal Medicine*, 117(12): 1003-1009, 1992.

Brummett BH, Barefoot JC, Siegler IC, et al. "Characteristics of Socially Isolated Patients With Coronary Artery Disease Who Are at Elevated Risk for Mortality." *Psychosomatic Medicine*, 63(2): 267-22, 2001.

Eaker ED, Sullivan LM, Kelly-Hayes M, D'Agostino RB and Benjamin EJ. "Marital Status, Marital Strain and Risk of Coronary Heart Disease or Total Mortality: The Framingham Offspring Study." *Psychosomatic Medicine*, 69(6): 509-513, 2007.

Cohen S. "Social Relationships and Health." *American Psychologist*, 59(8): 676-684, 2004.

Cohen S, Doyle WJ, Skoner DP, Rabin BS and Gwaltney JM. "Social Ties and Susceptibility to the Common Cold." *Journal of the American Medical Association*, 277(24): 1940-1944, 1997.

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 **Positive Health**