A healthy lifestyle composite measure: Significance and potential uses

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ABSTRACT

Objectives. Our objective was to create and explore potential uses of a composite "Healthy Lifestyle" measure based on Healthy People 2020 (HP2020) Objectives for behaviors shown to be associated with morbidity and mortality.

Methods. Data were from the 2013 Behavioral Risk Factor Surveillance System (N = 412,942) on five modifiable behaviors with HP2020 Objectives (leisure time exercise, eating fruits and vegetables 5 or more times/day, getting ≥7 h of sleep/24 h, not smoking and not drinking excessively). These indicators were combined to form an all-or-none composite Healthy Lifestyle (HLS) measure. Associations between the HLS measure and demographic and other measures, plus details of component measures, were reported.

Results. Results indicated that only 7.7% of adults reported a HLS with wide variation among states and demographic groups. Both unadjusted and logistic regression results found associations between a HLS and better health, lower rates of chronic disease and better access to health care. Over one fourth of all respondents (28.0%) needed to only improve fruit and vegetable consumption to be practicing a HLS.

Conclusions. In conclusion, few adults were practicing five behaviors that are generally recognized as healthy. All-or-none metrics like this HLS measure offer a fresh perspective on modifiable behaviors and the need for improvement. Examination of measure components can help explain demographic differences and identify strategies for improvement.

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Introduction

Numerous epidemiological studies have shown that lifestyle behaviors such as lack of exercise, poor diet, and smoking are associated with higher risk of morbidity and mortality (Brownson et al., 2010). Healthy People 2020 (HP2020), a set of objectives to drive federal, state, and local public health and prevention initiatives, recognizes individual behavior as one of the key determinants of health, and that positive changes in individual behavior can reduce rates of chronic disease (Healthy People 2020, n.d.-a). Several of its chapters include objectives relating to modifiable lifestyle behaviors such as tobacco use, diet, substance use (including alcohol), and physical inactivity, based on epidemiological studies showing their relation to health outcomes such as mortality and chronic disease. Sleep is a new addition to the most recent Healthy People document, with many studies backing up its importance to health and even association with mortality (Grandner et al., 2010; Gallicchio & Kalesan, 2009; Cappuccio et al., 2010; Hublin et al., 2007). Short sleep duration, especially <6 h a night, has been linked

to increased risk of hypertension (Gottlieb et al., 2006; Faraut et al., 2012), diabetes (Gottlieb et al., 2005; Yaggi et al., 2006), cardiovascular disease (CVD) (Knutson, 2010; Sabanayagam & Shankar, 2010), and suppressed immunity (Irwin et al., 2010; Irwin et al., 2008), including increased susceptibility to the common cold (Cohen et al., 2009). As an example of the magnitude of the effects, men that slept ≤5 or ≤6 h a night were twice as likely to develop diabetes compared with men sleeping 7 h (Yaggi et al., 2006). Sleep loss has been found to activate cellular markers of inflammation, which may help explain its effect on conditions related to inflammation such as CVD and diabetes (Irwin et al., 2010). Sleep also appears to be a less-recognized public health issue than smoking, diet, and exercise (Buysse, 2014).

Research has also shown that a combination of behaviors, termed a "healthy lifestyle," is associated with lower mortality and better health outcomes, however the definition of a healthy lifestyle has varied (Troost et al., 2012; van Dam et al., 2008; Loef & Walach, 2012; Fiona McKenzie et al., 2014; Chiuve et al., 2006; Nechuta et al., 2010; Fransen et al., 2014). Most definitions have included measures of smoking, diet, physical activity, and overweight or obesity, while some added alcohol use (van Dam et al., 2008; Fiona McKenzie et al., 2014; Chiuve et al., 2006; Nechuta et al., 2010; Fransen et al., 2014). In a meta-analysis of 15 prospective studies (Loef & Walach, 2012), only

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measures that included at least three of these five behaviors in the healthy lifestyle measure were selected for the study and the authors found that a healthy lifestyle was associated with lower mortality for all causes. Similar results were found for men (Chiuve et al., 2006) and women (van Dam et al., 2008; Fiona McKenzie et al., 2014; Nechuta et al., 2010) and with quality-adjusted life-years as the outcome (Fransen et al., 2014) instead of mortality. Despite the numerous studies employing a measure of healthy lifestyle, no measure has emerged as the standard and very little has been published on the prevalence. Using a measure that included non-smoking, physical activity, healthy weight, and eating fruits and vegetables five or more times per day, Reeves & Rafferty found that only 3.0% of adults reported all four, with little variation among subgroups (Reeves & Rafferty, 2005).

The major goal of this current study was to create a composite measure of "Healthy Lifestyle" (HLS) based on HP2020 Objectives and using data from the 2013 Behavioral Risk Factor Surveillance System (BRFSS). We describe the component indicators and discuss different ways the composite HLS measure can be used. We also report associations between a healthy lifestyle and demographic and selected health status measures and report both prevalence rates and adjusted odds ratios for a HLS.

Methods

Data

Data were from the 2013 BRFSS, downloaded from the Centers for Disease Control and Prevention (CDC) website which also contains detailed information on the survey methods and questionnaires (Behavioral Risk Factor Surveillance System (BRFSS) (Atlanta, Georgia), n.d.). The BRFSS conducts annual state-based telephone surveys of non-institutionalized U.S. adults concerning health behaviors related to the leading causes of premature morbidity and mortality. In general, data have been shown to be comparable to results from national surveys based on self-reported behaviors (Pierannunzi et al., 2013). The BRFSS includes "core" questions that are asked each year, questions that are asked in alternating years, and may also include topics of special interest to a state. Data were limited to the 483,865 respondents in the 50 states and the District of Columbia and included 128,807 cell phone surveys before unknown values were removed. For all the measures described below, responses of "don't know" or refusal to answer were excluded from the measure.

Healthy lifestyle measure

The five indicators selected for inclusion in the "Healthy Lifestyle" measure are all related to Healthy People 2020 (n.d.-a) Objectives. These included smoking (HP2020 Objective TU-1.1) (Healthy People 2020, n.d.-b), fruit and vegetable consumption (HP2020 Objectives NWS-14 & 15) (Healthy People 2020, n.d.-c), and physical activity (HP2020 Objective PA-1) (Healthy People 2020, n.d.-d), all of which are commonly included in such measures (van Dam et al., 2008; Fiona McKenzie et al., 2014; Chiuve et al., 2006; Nechuta et al., 2010; Fransen et al., 2014), plus excessive drinking (HP2020 Objective SA-15) (Healthy People 2020, n.d.-e), and adequate sleep (HP2020 Objective SH-4) (Healthy People 2020, n.d.-f). Because we included only behaviors in our measure, we excluded healthy weight, which we considered an outcome. We believe our measure is the first to include sleep, which we feel is justified based on the rapidly accumulating evidence of its association with health (Grandner et al., 2010; Gallicchio & Kalesan, 2009; Cappuccio et al., 2010; Hublin et al., 2007; Gottlieb et al., 2006; Faraut et al., 2012; Gottlieb et al., 2005; Yaggi et al., 2006; Knutson, 2010; Sabanayagam & Shankar, 2010; Irwin et al., 2010; Irwin et al., 2008; Cohen et al., 2009) and its recent addition to Healthy People 2020 (Healthy People 2020, n.d.-f).

Current smoking status was ascertained from two questions: "Have you smoked at least 100 cigarettes in your life?" and, if yes, "Do you now smoke cigarettes every day, some days, or not at all?" Current smokers were defined as respondents who smoked 100 cigarettes and now smoked every day or some days, and therefore non-smokers were those who did not currently smoke. For physical activity, the question on sedentary lifestyle asked each year on the BRFSS was used: "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" and a response of "yes"

was considered any physical activity. Fruit and vegetable consumption was addressed through responses to six separate questions on the frequency of consumption of fruit juice, fruit, cooked or canned beans, dark green vegetables, orange-colored vegetables, and other vegetables other than fried potatoes. Responses were combined by CDC into total number of times fruits and vegetables were consumed per day. We modified those totals to remove missing values and values for fruits of >16 times per day and for vegetables of >23 times per day which were exclusion criteria defined by CDC. Values for fruits and vegetables were then added together and dichotomized into eating the combination 5 or more times a day (desirable) or <5 times/day.

Hours of sleep were reported as round numbers given in response to the question "On average, how many hours of sleep do you get in a 24-hour period?" Results were dichotomized into <7 h vs. 7 or more hours, with the latter considered desirable and included in our measure. Alcohol consumption was addressed on the BRFSS through four questions from which CDC calculated variables for heavy drinking (more than two drinks per day on average for men or more than one drink per day on average for women) and binge drinking (5 or more drinks during a single occasion for men or four or more drinks during a single occasion for women) during the past 30 days. These two measures were combined into a measure of excessive drinking (HP2020 Objective SA-15) (Healthy People 2020, n.d.-e). For our composite measure, we included respondents who did not drink excessively, thus "moderate" drinkers (including men who drank an average of two drinks a day or less and women who drank an average of one drink or less per day) and non-drinkers were among those who did not drink excessively.

Once unknowns were removed, final N's for the five separate component indicators ranged from 426,872 for fruit and vegetable consumption to 476,605 for sleep. To generate the composite measure for all five components, the number of desirable behaviors as defined above was counted, with a total that could range from 0 to 5. Unknowns were removed from the composite measure if any of the components were unknown, resulting in a final sample size of 412,942. For most analyses the measure was dichotomized to adults reporting all five behaviors vs. those reporting 0–4 behaviors, with those reporting all five considered to be living a "Healthy Lifestyle" (HLS). Additional analysis was done with the sleep indicator removed from the measure and changing fruit and vegetable consumption to one or more servings each. In addition, among adults who reported four of the five behaviors, we determined which desirable behavior was most likely to be missing.

Other variables

Additional variables included age, which excluded 4664 respondents for whom CDC imputed their age, region (Northeast, Midwest, South and West) (Northeast = ME, NH, VT, MA, CT, RI, PA, NY, NJ; Midwest = IL, IN, MI, OH, IA, KS,MN, MO, NE, ND, SD, WI; South = AL, AR, DE, DC, FL, GA, MD, NC, SC, VA, WV, KY, MS, TN, LA, OK, TX; West = AK, AZ,CA, CO, HI, ID, MT, NV, NM, OR, WA, UT, WY), season of the year, disability status (any of the following: difficulty seeing, walking, bathing/dressing, with cognition, or doing errands), the six chronic diseases monitored by HP 2020 (Healthy People, 2020) (current asthma, arthritis, cardiovascular disease (CVD), cancer other than skin, chronic

Table 1

Components of a composite Healthy Lifestyle measure,[a] 2013 Behavioral Risk Factor Surveillance System, N = 412,942.

Component	Percent	95% CI[b]
Not smoking	81.8	81.5,82.0
Getting leisure time exercise	73.7	73.4,74.0
Eating fruits/vegetables 5 + X/day	17.2	17.0,17.5
Sleeping ≥7 h/24	64.4	64.1,64.7
Not binge or heavy drinking	82.1	81.9,82.4
Number of components reported (0–5)		
0	0.7	0.6,0.7
Any 1	5.1	5.0,5.3
Any 2	17.3	17.1,17.6
Any 3	34.7	34.4,35.0
Any 4	34.5	34.2,34.8
All 5	7.7	7.6,7.9
Total	100	

[a] Healthy Lifestyle: not smoking, getting leisure time exercise, eating fruits and vegetables 5 or more times/day, no binge or heavy drinking and getting ≥7 h of sleep a night.

[b] CI: confidence interval.