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Health Behavior Risk Factors Across Age as Predictors of Cardiovascular Disease Diagnosis

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Abstract

Objectives—The current study examines the prevalence of health risk behaviors and their cumulative effects on cardiovascular disease (CVD) among a sample of adults. Age cohort is also examined to determine the role of age in predicting CVD and risky health behaviors.

Method—Medical records of a sample of adults from the Seattle Longitudinal Study categorized into one of four age-group cohorts were examined. Data regarding participants' health risk behaviors were examined individually and cumulatively for predicting later CVD diagnosis.

Results—The prevalence of CVD increases with age, obesity, and risky medical checkups. Female risky sleepers are more likely to receive a CVD diagnosis than men who report risky sleep patterns ($p < .05$).

Discussion—A high risk of CVD appears to exist for adults across the life span, and several risky health behaviors also seem to place individuals more at risk for being diagnosed with CVD.

Keywords

cardiovascular disease; aging; obesity

Health behavior risk factors have gained the attention of researchers over the last several decades due to the risk they pose on individual health. Research has consistently shown that a strong relationship exists between health risk behaviors, disease, and mortality (Rosal et al., 2001; Taubman-Ben-Ari & Findler, 2005), with a few specific health behavior risk factors given greater scrutiny than others due to their more obvious impact on health. Fairly consistently, the literature demonstrates the field's interest in the following health behavior

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risk factors: smoking, obesity, sedentariness, and excessive drinking (Hensrud & Klein, 2006; Rosal et al., 2001). Results have demonstrated a strong link between these health risk behaviors and various health problems and disease (e.g., cancers and cardiovascular disease (CVD); Giardina, 1998; Rosal et al., 2001; Stampfer, Hu, Manson, Rimm, & Willett, 2000; Yusef, Giles, Croft, Anda, & Casper, 1998).

Although many health problems are worthy of study, CVD has received a great deal of attention in the health behavior risk factor literature. This is primarily due to two issues. First, the health risks and death rate associated with CVD is high. Statistics show that almost 62 million Americans had one or more forms of heart and blood vessel disease in 2000 and that every 33 seconds someone died from CVD of the same year (Cardiovascular Disease Statistical Summary 2000, 2003). Second, several risk factors such as obesity, high-fat diet, and a sedentary lifestyle are known contributors to heart disease (Cardiovascular Disease Statistical Summary 2000, 2003; Hensrud & Klein, 2006), and these health risks are found in increasing numbers within the population. By further studying CVD in terms of these and other important health risk behaviors, this study hopes to further contribute to understanding the impact of several health risk behaviors on cardiovascular health.

Although other studies have examined the association between health behavioral risk factors and various diagnoses and health outcomes, a smaller number of studies have examined the relationship of health behavior risk factors and disease over time. Instead, methodology has relied on cross-sectional snapshots of prevalence rates for disease and health behaviors. Although these studies have provided findings that suggest that health behaviors have a correlated association to the health problems at issue, these studies only look at the presence of the health risk behaviors and disease during one point in time (Dickerson, Pater, & Origoni, 2002; Green & Polen, 2001; Himelhoch et al., 2004; Jiang & Hesser, 2006). Longitudinal studies would provide researchers with the ability to potentially view health risk behaviors and subsequent changes to individuals' health status. Such findings may assist in predicting which health behavior risk factors most likely predict the diagnosis of specific diseases such as CVD over time.

Using a longitudinal study design, this study attempted to examine the relationship between seven health behavior risk factors and the later presence of a CVD diagnosis. Data from the Seattle Longitudinal Study (SLS) was analyzed; this is a longitudinal study of adults that began in 1956 and has continued to collect data in 7-year intervals to the present. This sample provides researchers with a unique opportunity to observe health behaviors and their effect on individuals' level of disease and morbidity over time.

In this study, we examined the health behaviors in which people reported being engaged, and then we determined whether these participants received a diagnosis for CVD over a 7-year period. This study did not account for whether a CVD diagnosis existed prior to the health behavior assessment; however, these findings should be able to demonstrate the relationship between certain health risk behaviors and subsequent CVD diagnoses. In terms of health behavior risk factors, the SLS collects data concerning smoking, excessive drinking, obesity, lack of exercise, poor sleeping habits, lack of medical checkups, and dental care. These are the health behaviors used as independent variables in this study.

The purpose of this study is to explore the extent to which risky health behaviors predicted diagnosis for CVD over a 7-year period in a northwestern U.S. population. We hypothesize that several of the selected health behavior risk factors will increase the likelihood of diagnosis of CVD. Specifically, smoking and obesity will increase the likelihood of diagnosis for CVD. The relationship between the remaining health behavior risk factors and CVD is exploratory.

A secondary objective is to examine potential age effects coupled with risky health behaviors on CVD diagnosis risk. Specifically, do the relationships between risky health behaviors and diagnosis for CVD vary for individuals of different ages? Current literature in this area has found that age has some effect on health behaviors. Zanjani, Schaie, and Willis (2006) found that change in health behaviors varied across age/cohort groups. Positive health behavior changes were observed in middle-aged and young-old adults who had been diagnosed with adverse health conditions, whereas old-old adults displayed no positive health behavior changes regardless of their health status. Conversely, other studies have indicated that younger age is related to a greater likelihood of engaging in more negative health behaviors (Rosal et al., 2001). It is likely that both findings contribute to paint a more descriptive picture for how age affects health behaviors such that most people give increased attention to improving their health behaviors when they begin to notice the effects of aging on their bodies and health (e.g., middle-aged and young-old adulthood). To date, no study has determined whether obesity or smoking have more of an impact on health status for middle-aged or young-old adults. Therefore, this study attempts to examine the interaction of age with these and the other previously mentioned health behaviors of interest.

Method

Sample

The study sample consisted of 963 participants from the 1993 wave of the SLS. Participants were members of the Group Health Cooperative of Puget Sound, a health maintenance organization (HMO) serving residents in the greater Seattle, Washington, area. This longitudinal study began in 1956 and has continued to collect data on participants in 7-year intervals. More detailed description of the SLS can be found in previous publications (e.g., Schaie, 2005).

Participants were first categorized into age/cohort groups: young adults = 25–44 (14.85%), middle-aged adults = 45–64 (36.76%), young-old adults = 65–74 (30.01%), and old-old adults = 75–91 (18.38%). The ethnicity of the sample was homogenous, with 95% of the sample classified as White.

All participants provided voluntary written consent regarding the use of their information for research purposes before data were collected for each wave of the study.

Assessments

The 1993 wave of the SLS included the Health Behavior Questionnaire (HBQ); variables from this questionnaire were used to assess health behaviors of the participants. Cardiovascular health was assessed using medical records available from 1992 to 1998.

Health Behavior Risk Factors

Seven health behavior risk factors were selected for these analyses due to their well-documented associations with health outcomes (Bodenheimer, Wagner, & Grumbach, 2002; Caskie, Schaie, & Willis, 2000; Zanjani et al., 2006): smoking, drinking, weight, exercise, sleep, medical checkups, and dental care. Variables were further coded as risky or nonrisky based on public health recommendations. Risky dimensions were defined as the following:

- *Smoking:* current smoking (U.S. Preventive Services Task Force, 2005);
- *Drinking:* men consuming 14 or more drinks/week, women consuming 12 or more drinks per week (National Institute on Alcoholism and Alcohol Abuse, 2005);
- *Weight:* body mass index ≥ 30 (obese; World Health Organization, 1998);

- *Exercise:* less than 3 hr of exercise/week;
- *Sleep:* sleeping less than 6 hr or more than 8 hr a night (Kripke, Garfinkel, Wingard, Klauber, & Marler, 2002);
- *Medical checkups:* failing to visit the doctor at least once during the previous year (Prochaska & DiClemente, 1985); and
- *Dental care:* never brushing or flossing one's teeth and failing to visit the dentist at least once during the previous year (U.S. Department of Health and Human Services, 2007), as this has been found to be associated with poor health outcomes (Zanjani et al., 2006).

These were coded dichotomously where 1 = *risky status* and 0 = *nonrisky status*.

To investigate the effect of multiple risky health behaviors on diagnosis for CVD, a cumulative risk variable was developed as a summation of the amount of risky behaviors reported by each participant. This variable was analyzed as ordinal and ranged from 0 to 5. The highest amount of morbidities reported by any one participant was 5.

CVD Diagnosis

Diagnostic information was collected from HMO diagnoses data available between 1992 and 1998. All data were coded using the International Classifications of Disease–Version 9 (ICD-9). CVD covers a wide spectrum of ICD-9 coding (e.g., 390–459). Although the current study sought to include the various aspects of diagnoses for CVD, the following were excluded from this study's categorizations: varicose veins (454 and 456), hemorrhoids (455), and "other diseases of the circulatory system" (459), which included conditions such as unspecified hemorrhage, vein compression, and unspecified chronic venous insufficiency. These codes were excluded due to their general nature and to limit misrepresentation of what is more commonly considered serious issues in cardiovascular health. Thus, diagnosis for CVD in the current study was represented the following ICD-9 codes: Acute Rheumatic Fever (390–392), Chronic Rheumatic Disease (393–398), Hypertensive Disease (401–405), Ischemic Heart Disease (410–414), Disease of Pulmonary Circulation (415–417), Other Forms of Heart Disease (420–429), Cerebrovascular Disease (430–438), Diseases of Arteries, Arterioles, and Capillaries (440–448), Phlebitis and Thrombophlebitis (451), Portal Vein Thrombosis (452), Other venous embolism and thrombosis (453), Noninfectious disorders of lymphatic channels (457), and Hypotension (458). The diagnosis of CVD was coded dichotomously, where 1 indicated the presence of the diagnosis and 0 indicated the absence.

Analyses

All statistical analyses were examined using SAS 9.1 software. All variables in the current study are categorical; thus sample characteristics were summarized with counts and percentages. The chi-square test of independence was completed for all explanatory variables based on age group and CVD diagnosis status to determine between group differences. Single variable logistic regressions were used to determine the effect of the independent variables of interest on subsequent CVD diagnosis. Logistical regression was also used to determine interaction effects of age and gender combined with risky health behaviors in the presence of CVD diagnosis. Final analysis accounted for the effect of all found significant predictors of CVD diagnosis by using multiple logistical regressions.

Results

Sample Description

Frequency distributions showed that 54.52% of participants had a diagnosis of CVD (Table 1). When examining age differences, the prevalence of CVD diagnosis increased as age increased. The majority of individuals categorized as young and middle-aged did not receive a CVD diagnosis; however, a majority of the participants in the young-old and old-old groups did receive a diagnosis for CVD, and the majority of individuals in those groups have a CVD diagnosis. These findings demonstrate the progression of low risk for cardiovascular health diagnoses in young adulthood to the high risk faced by old-old adults.

Prevalence of health risk behaviors appeared to differ by age group. Findings revealed significant differences for obesity, risky sleep patterns, lack of regular medical checkups, and risky dental care. Middle-aged adults had the highest proportions of obese participants (23.45%), whereas old-old participants had the lowest reported obesity levels (10.73%). Regarding sleep behavior, proportions of participants reporting risky sleep patterns increase as age advances with young and middle-aged adults more likely to get at least 6 hr and not more than 8 hr of sleep a night, on average, than young-old and old-old adults. Prevalence of risky medical checkup behavior generally decreased with age, with an increase in reported risk for old-old adults compared to young-old adults. Finally, age differences were found for risky dental care, which suggests a U-shaped trend. Young and old-old adults were least likely to engage in good dental care, with 34.27% and 31.07%, respectively, reporting risky behavior, whereas middle-aged and young-old adults were most likely to take proper care of their dental needs.

Young-old adults reported the highest prevalence of zero cumulative risky health behaviors. Conversely, old-old adults reported the highest prevalence of one cumulative risky health behavior. In other words, old-old participants had the highest prevalence of participants reporting one risky health behavior. In general, prevalence for higher cumulative risky health behaviors tended to occur in young and middle-aged adults, although young-old adults had the largest proportion of participants reporting five risky health behaviors (1.04%).

Effects of Risky Health Behaviors on Cardiovascular Diagnosis

We examined the independent and cumulative risk of seven negative health behaviors on cardiovascular health. Between-group differences were found for obesity and risky medical checkup between those diagnosed and not diagnosed with subsequent CVD (see Table 1). No between-group differences for cardiovascular diagnosis were found regarding cumulated risk (see Table 1).

Single variable logistical regressions (Table 2) supported the previous results, as obesity and medical checkup behavior were the only health behaviors that independently predicted subsequent CVD diagnosis. Specifically, individuals who were obese at baseline had nearly 41% greater odds of receiving a diagnosis for CVD during the study period over those who had BMI of less than 30. Conversely, those who reported risky medical checkup behaviors had significantly less odds of receiving a diagnosis for CVD during the course of the study. Logistical regression analyzing cumulated risk for multiple negative health behaviors found no significant effects on CVD diagnosis.

Interactions—Chi-square and logistical regression analysis identified significant age-group and gender associations with CVD diagnosis. Therefore, logistical regressions were further performed to determine whether interaction effects are present between age group or gender and health behavior risk factors in predicting CVD diagnosis. No significant interactions were found regarding age groups and risky health behaviors when predicting CVD diagnosis. However, an interaction effect was found ($p < .05$) between gender and sleep behavior when predicting CVD diagnosis. Specifically, female risky sleepers were significantly more likely to receive a diagnosis for CVD (65%) than men who reported risky sleep patterns (54%; data not shown).

Effects of Multiple Predictors on CVD Diagnosis

The final multiple logistical regressions model analyzed the effects of age group, gender, obesity, and medical checkup behavior on CVD diagnosis (Table 3). The max-rescaled R^2 (.2868) indicates that close to 30% of the variance in CVD diagnosis is accounted for by age, gender, obesity status, and medical checkup status.

Discussion

Understanding the longitudinal predictive value of risky health behaviors in relationship to age and CVD diagnosis is not well understood. The current study addresses this, as the purpose was to examine the relationship between health risk behaviors and CVD from a longitudinal standpoint with a cross section of age groups. This study examined the effects of common risky health behaviors and age cohort as predictors of a CVD diagnosis to investigate the role these factors play in predicting CVD across time. By determining the health risk behaviors that have the strongest relationship with CVD, this study's findings add to the field's understanding of which preventive steps are most likely to reduce the risks of heart disease in patients. The findings of this study suggest that certain health behaviors have a relationship with cardiovascular health as well as illustrate the possibility that some health risk behaviors are more severe in specific age groups or gender categorization.

Cardiovascular health poses a substantial risk to millions of U.S. adults (Cardiovascular Disease Statistical Summary 2000, 2003). The results of the current study demonstrate this health crisis issue as the majority of the participants received a diagnosis of CVD during the 7-year study period. Consistent with previous research, the results of this study indicated that the prevalence of CVD was highest among older age groups (Cardiovascular Disease Statistical Summary 2000, 2003). Specifically, the young adults in our study had the lowest incidence of a CVD diagnosis, and the prevalence of diagnosis increased with each progression of age group, culminating with more than 80% of old-old adults receiving a CVD diagnosis. Considering that nearly half of our sample received a CVD diagnosis within the 7-year time period of this study, further examination of health risk behaviors and age related to the prevalence of a CVD diagnosis within our sample was of interest.

We hypothesized that being a current smoker would significantly predict a diagnosis for CVD. Although strong evidence exists in the literature that smoking has a strong association with CVD (Cardiovascular Disease Statistical Summary 2000, 2003), our study was not able to demonstrate this, as risky smoking status had no significant effect on the diagnosis for this condition. The lack of such a finding may be an artifact of the sample; specifically, the majority of current smokers were below 65 and thus were less likely to be diagnosed with CVD due to their age. Had the sample contained more current smokers in the more advanced age groups, an effect would have a greater chance of showing significance.

Several health risk behaviors were widespread throughout the sample, including that slightly less than half of the participants did not exercise more than three times a week. Although this is not a significantly low percentage of individuals with a sedentary lifestyle compared to the national average (Hensrud & Klein, 2006), previous research has established that a sedentary lifestyle places one at risk for many health problems (e.g., CVD, arthritis; Hensrud

& Klein, 2006). In addition, many of the participants did not get regular medical checkups or have sufficient dental care, and although obesity in this sample was not as high as the national average, which is approximately 30% of the population (Cardiovascular Disease Statistical Summary 2000, 2003; Flegel, Carroll, Ogden, & Johnson, 2002), nearly 1 out of 5 participants had a BMI above 30.

This study's second hypothesis was that obesity would increase the likelihood of CVD diagnosis. The results of this study support this hypothesis, as a significantly higher proportion of those diagnosed with CVD were also obese compared to the proportion of those not diagnosed. As with risky smoking, the majority of those who reported obesity were below 65. This seems to suggest that obesity poses an additional risk for our sample outside of age, as proportionally less young and middle-aged adults received CVD diagnosis.

Analysis of the remaining risky health behaviors' relationship to CVD diagnosis was exploratory. This exploratory analysis revealed that nonrisky medical checkup behavior was significantly associated with CVD diagnosis. Our findings basically show that those individuals who go to the doctor at least once a year are more likely to be diagnosed with CVD. This makes logical sense due to the fact that patients only get diagnosed and have those diagnoses charted in the medical files when they in fact visit their doctors. This clearly does not mean that their health is worse but only that their health problem(s) have been identified and are likely being treated and monitored, unlike those in their cohort who do not have regular medical exams. This may also indicate that some cases of CVD may have gone undiagnosed in our sample during the study period.

Based on our findings, age appears to have an association with higher rates of certain health risk behaviors. In our sample, young adults were the least likely to drink excessively or to have poor sleeping patterns. The middle-aged adults were least likely to have poor dental care, and young-old adults were least likely to be neglectful regarding yearly doctor visits. Middle-aged and young-old adults were both less likely to lack sufficient amounts of exercise. Old-old adults, on the other hand, were least likely to smoke and to be obese. Although findings from other studies have found that younger individuals are more likely to demonstrate health risk behaviors (Prattala, Karisto, & Berg, 1994; Rosal, Ockene, Hurley, & Reiff, 2000; Ungemack, 1994), a closer look suggests that those individuals who are considered "young" by these studies actually straddle the young and middle-aged adulthood age groups. One study actually found that middle-aged adults (along with young-old adults) engage in positive health behavior changes when faced with adverse health conditions (Zanjani, Schaie, & Willis, 2006), but the current study's results indicate that negative behaviors are prevalent for these age groups. This suggests that we should be asking the following: (a) What happens between young adulthood (24–44 years) and our middle-aged adulthood (45–64 years) that might account for the observed differences? and (b) Can we design a study that examines changes in health behavior risk factors for these age groups?

We found that the prevalence for having a diagnosis for CVD increases with older age. This finding is consistent with previous research (American Heart Association, 2007); however, the differences in the prevalence rates for each age group were notable. Young adults had the lowest risk for CVD, with only approximately a third of the sample having a diagnosis for the disease, but by old-old adulthood, the prevalence increased exponentially, with approximately 87% being diagnosed with CVD. When we examined age differences for each health behavior's ability to predict CVD, we found that there was an overall age effect. Further analyses revealed that old-old adults were significantly different from the other three age-group cohorts. Although with age comes the decline in some health and functioning, any attempt to determine what behaviors may contribute to this vast difference in prevalence is worth the effort. Along these lines, we attempted to examine the interaction of age and health behavior and their effect on CVD, but our analyses revealed no significant interaction between each of the health behaviors and age. Nonetheless, further studies may discover an age/health behavior interaction to help determine at what age certain health behaviors pose the most risk.

Limitations and Future Research

Limitations of this study are mostly limited to the fact that the SLS data set is very large and comprehensive, but it does not allow for specific detailing of when health risk behaviors began and the exact timing of diagnosis. Due to this, this study cannot make conclusive remarks regarding the causal effect of health risk behaviors on CVD. Future studies may be able to use different methodology that will enable researchers to identify specific time markers for onset of health risk behaviors and diagnosis. For example, studies may consider using a life history assessment that enables individual to record when they (a) started a health risk behavior, (b) began showing symptoms of disease or poor health, and (c) were diagnosed with a health condition. This assessment would allow researchers to make even more conclusive statements regarding the effects of health behavior risk factors on health conditions. Essentially, this would allow health behavior risk factors and diagnoses to be isolated to clearly determine the direct effect(s) of these risk factors on disease rates.

Another limitation is related to the wording of items within the questionnaires. Specifically, lack of healthy exercise levels is measured by an item that asks respondents to report their level of activity, excluding housework and daily chores. This likely attenuates the total amount of exercise that younger, more active individuals report, and thus, likely results in inferring that younger adults may be less active than older adults. Future studies should be aware of the wording for exercise-level questions so as to avoid any misleading conclusions.

A final limitation is that a large majority of the SLS participants are White. Therefore, results from this study are not generalizable to the population as a whole. Due to the relatively small amount of non-White participants in this study, potential race effects were not examined.

Future research might also examine changes in health risk behaviors that occur from young to middle-aged adulthood. The current study cannot make such conclusions, but it would be interesting to investigate whether some of the differences observed in this study and others can be examined with a longitudinal study that follows the changes of health status and health risk behaviors across time. By examining change over time, researchers may be able to assist the medical profession with interventions focused on minimizing health risk behaviors that typically place people at increased risk for health problems. These finding may identify the most opportune times for individuals to begin adopting or changing their health behaviors so as to prevent disease and extend their life expectancies.

Conclusion

The current study identified a high rate of CVD diagnosis in a large sample from a longitudinal study (much like the national average) and found that age and obesity are factors that put individuals at risk for receiving a CVD diagnosis. Obesity has become a national health crisis and one that can be alleviated with awareness of the health implications and the implementation of health intervention programs. Although aging is not a factor that can be remedied, many behavior risks are magnified with advanced age. Risk can be decreased with behavior modification or changed as encouraged through these same health intervention strategies. With a concentrated effort at identifying and understanding the effects of risky health behaviors, interventions may be designed that are geared toward promoting positive health behaviors and a greater quality of life.

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Table 1

Sample Characteristics by Age and CVD Diagnosis

	Total Sample		Age Group					CVD Status		
			Young (25–44)	Middle (45–64)	Young-Old (65–74)	Old-Old (75–91)		Diagnosis	No Diagnosis	
Variable	***N* = 963**	**%**	***n* = 143**	***n* = 354**	***n* = 289**	***n* = 177**	***p* Value**	***n* = 525**	***n* = 438**	***p* Value**
Female	546	56.82	56.64	57.10	55.71	58.19	.9611	52.20[a]	62.33[a]	.0016[a]
CVD diagnosis	525	54.52	15.38[a]	44.92[a]	68.17[a]	83.05[a]	.0001[a]			
Age *M* (*SD*)	61.27	14.12	5.18	5.72	2.91	3.40				.0001[a]
Young	143	14.85						4.19[a]	27.63[a]	
Middle	354	36.76						30.29[a]	44.52[a]	
Young-old	289	30.01						37.52[a]	21[a]	
Old-old	177	18.38						28[a]	6.85[a]	
Health behaviors										
Current smoker	55	5.71	6.99	7.34	5.54	1.69	.0573	4.95	6.62	.2665
Risky drinking	49	5.09	2.80	5.65	6.57	3.39	.2443	4.57	5.71	.4243
Obese	171	17.76	19.58[a]	23.45[a]	14.19[a]	10.73[a]	.0008[a]	20[a]	15.07[a]	.0461[a]
Sedentary	441	45.79	52.45	43.22	43.94	48.59	.2168	45.52	46.12	.8536
Risky sleep	86	8.93	5.59[a]	5.93[a]	10.73[a]	14.69[a]	.0026[a]	9.90	7.76	.2457
Risky medical	236	24.51	40.56[a]	31.92[a]	12.46[a]	16.38[a]	.0001[a]	17.52[a]	32.88[a]	.0001[a]
Risky dental	260	27	34.27[a]	23.45[a]	25.26[a]	31.07[a]	.0453[a]	28.76	24.89	.1773
Cumulated risk										
0 risky behaviors	247	25.65	18.18[a]	24.86[a]	29.76[a]	26.55[a]	.0096[a]	27.24	23.74	.7557
1 risky behavior	325	33.75	26.57[a]	32.77[a]	35.99[a]	37.85[a]		33.33	34.25	
2 risky behaviors	247	25.65	36.36[a]	25.14[a]	24.22[a]	20.34[a]		24.76	26.71	
3 risky behaviors	103	10.70	13.29[a]	11.58[a]	6.92[a]	12.99[a]		10.67	10.73	
4 risky behaviors	35	3.63	4.90[a]	5.08[a]	2.08[a]	2.26[a]		3.62	3.65	
5 risky behaviors	6	0.62	0.70[a]	0.56[a]	1.04[a]	0[a]		0.38	0.91	

Note: CVD = cardiovascular disease. Frequencies in percentage unless otherwise noted.

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[a]Significance between group differences ≤.05.

Table 2

Single Variable Logistical Regressions Examining the Predictability of Health Behaviors, Age, and Gender on CVD Diagnosis (OR Depicting the Probability That CVD = 1 or Diagnosis Received)

Independent Variables	CVD Diagnosis OR (95% CI) *n* = 525
Age group	
Young (25–44)	Reference
Middle-aged (45–64)	4.483 (2.72–7.40)*
Young-old (65–74)	11.774 (7.02–19.75)*
Old-old (75–91)	26.939 (14.78–49.12)*
Gender	
Female	Reference
Male	1.515 (1.170–1.962)*
Health behavior[a]	
Current smoker	0.735 (0.43–1.27)
Risky drinking	0.791 (0.45–1.41)
Obese	1.409 (1.01–1.98)*
Sedentary	0.976 (0.76–1.26)
Risky sleep	1.306 (0.83–2.05)
Risky medical	0.434 (0.32–0.59)*
Risky dental	1.219 (0.91–1.62)
Cumulated risk	
0 risky behaviors	Reference
1 risky behavior	0.848 (0.61–1.19)
2 risky behaviors	0.808 (0.57–1.15)
3 risky behaviors	0.867 (0.55–1.38)
4 risky behaviors	0.864 (0.424–1.76)
5 risky behaviors	0.364 (0.07–2.02)

Note: CVD = cardiovascular disease; OR = odds ratio; CI = confidence interval.

[a]Health behavior reference variable is nonrisky status for all.

*$p \leq .05$.

Table 3

Multiple Logistical Regression for Predictive Value of Specific Health Behaviors on CVD Diagnosis Controlling for Age and Gender (Max-Rescaled R^2 = .2868)

Independent Variables	CVD Diagnosis OR[a] (95% CI) *n* = 525
Age group	
Young (25–44)	Reference
Middle-aged (45–64)	4.355 (2.62–7.25)*
Young-old (65–74)	11.358 (6.66–19.36)*
Old-old (75–91)	28.394 (15.33–52.58)*
Gender	
Female	Reference
Male	1.798 (1.34–2.42)*
Health behavior[b]	
Obese	2.041 (1.39–3.00)*
Risky medical	0.554 (0.39–0.78)*

Note: CVD = cardiovascular disease; OR = odds ratio; CI = confidence interval.

[a]Indicates controlling for all variables in the model.

[b]Indicates health behavior reference variable is nonrisky status.

*$p \leq .05$.