A Longitudinal Study of the Relationships Between Conscientiousness and the Social-Environmental Factors and Substance-Use Behaviors That Influence Health

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ABSTRACT The present study tested the relationships among conscientiousness-related traits, social-environmental factors that affect health, and substance-use behaviors across a 30-year period from age 21 to age 52 in the Mills Longitudinal study of women (N = 99). Results showed that the trait of social responsibility (a facet of conscientiousness) assessed at age 21 predicted family, work, and substance use outcomes at midlife (age 43 and age 52). In turn, marital quality, duration of marriage, divorce, participating in paid work, status level of work, and marijuana consumption were associated with changes in social responsibility. The implications for personality, health, and personality development are discussed.

Conscientiousness refers to individual differences in the propensity to follow socially prescribed norms for impulse control, to be task- and goal-directed, to be planful, delay gratification, and follow

norms and rules (John & Srivastava, 1999). There is accumulating evidence that the individual differences in conscientiousness influence health and longevity, in part through their effect on health behaviors, such as tobacco and alcohol consumption (Caspi et al., 1997; Friedman et al., 1993; Friedman, 2000; Hampson, Andrews, Barckley, Lichtenstein, & Lee, 2000; Martin & Friedman, 2000), and through their effect on social-environmental factors that contribute to health, such as family structure and socioeconomic status (Judge, Higgins, Thoreson, & Barrick, 1999; Kelly & Conley, 1985; Tucker, Kressin, Spiro, & Ruscio, 1998; Tucker, Schwartz, Clark, & Friedman, 1999). Other studies have shown that these health behaviors and social-environmental factors affect health and longevity (Friedman et al., 1993; McGinnis & Foege, 1993; Stampfer, Hu, Manson, Rimm, & Willett, 2000; Tucker et al., 1999).

Almost all research to date linking conscientiousness-related traits to the health process has been unidirectional. That is, most research has adopted a trait model and predicted health outcomes from personality traits using either cross-sectional or prospective designs (cf., Stein, Newcomb, & Bentler, 1987). These studies assume traits are causal mechanisms that facilitate specific behaviors or life events. What these studies overlook is the possibility that health behaviors and social-environmental factors may be reciprocally related to conscientiousness-related traits over time. In other words, participation in certain health behaviors or experiencing specific social-environmental factors may change conscientiousness-related traits.

In the present study, we used data from the Mills Longitudinal Study of Women (Helson & Wink, 1992; Roberts & Helson, 1997) to test the relationships among conscientiousness-related traits, social-environmental factors, and substance-use behaviors over a 30-year period. The Mills Longitudinal Study provides an advantageous database to draw upon because data on personality traits were available in college and twice in midlife, and family, work, and substance use variables also were available twice in midlife. The goals of this study were: (1) test the prospective relationship between conscientiousness-related traits and social-environmental factors and substance-use behaviors known to be related to health and longevity; and (2) test whether these same social-environmental factors and substance-use behaviors were associated with changes in conscientiousness over time.

Conscientiousness-Related Traits in the Health Process: Relations to Substance-Use Behaviors and Social-Environmental Factors

According to Adler and Matthews (1994), personality traits act on health outcomes through their action on social-environmental factors, health-related behaviors, and psychophysiological mechanisms. To our knowledge, conscientiousness-related traits have been linked to social-environmental factors and to health behaviors, but not to psychophysiological mechanisms. Accordingly, we will focus on the how conscientiousness influences the health process through its effect on important health behaviors and social-environmental factors linked to health.

In the present study, we will focus on three substance-use behaviors within the larger family of health behaviors—tobacco, alcohol, and marijuana consumption—because they are available at two time points in the Mills Longitudinal Study, and also because alcohol and tobacco consumption, in particular, are two of the most risky health behaviors. For example, in a study of 84,129 nurses, Stampfer et al. (2000) showed that tobacco smoking increases rates of heart disease, the leading cause of death in the United States. Excessive alcohol consumption is associated with liver disease, immune system suppression, cardiomyopathy, coronary heart disease, hypertension, arrythmia, stroke, and bone disease (U.S. Department of Health and Human Services, 2000). In addition, marijuana consumption is associated with an increased risk of myocardial infarction for older users, especially during the initial 60 minutes following marijuana use (Mittleman, Lewis, Maclure, Sherwood, & Muller, 2000).

Social-environmental factors are context-dependent experiences that either detract from health (e.g., stressful events or life circumstances) or promote health (e.g., strong social connections; Adler & Matthews, 1994). For example, one distinctly stressful social-environmental factor, poverty (i.e., low socioeconomic status), is related to poor health outcomes for both men and women (Adler et al., 1994; Ostrove, Adler, Kuppermann, & Washington, 2000). Stressful experiences within marriage, such as divorce, also are linked to poor health outcomes and decreased longevity (Tucker, Friedman, Wingard, & Schwartz, 1996). In contrast, having greater levels of social connection, such as having more children, belonging

to clubs, churches, and other organizations, is linked to positive health outcomes and increased longevity (House, Landis, & Umberson, 1988; Samuelsson & Dehlin, 1994; Tucker et al., 1999).

Most previous research linking conscientiousness-related traits to substance-use behaviors and social-environmental factors has utilized broad measures of conscientiousness or two specific facets of conscientiousness: Impulse control (sometimes described as cautiousness or its opposite, impulsiveness) and social responsibility (sometimes described as dutifulness or socialization). Broad measures of conscientiousness found in Big Five marker scales (Goldberg, 1992) are negatively related to alcohol consumption (Cook, Young, Taylor, & Bedford, 1998). Impulse control, or the propensity to act cautiously, has been linked to lower tobacco consumption (Clark & Watson, 1999; Watson & Clark, 1993) and to lower drug and alcohol use (Caspi, et al., 1997; Clark & Watson, 1999; Cooper, Agocha, & Sheldon, 2000; Shedler & Block, 1992; Sher & Trull, 1994; Watson & Clark, 1993). Dutifulness, reflected in measures of social responsibility, norm adherence, or its opposite, psychoticism, is associated with diminished tobacco and alcohol consumption (Tucker et al., 1995), and lower drug consumption (Burger & Collins, 1982).

There also is a body of literature linking these conceptions of conscientiousness to social-environmental factors that in turn affect health and longevity. Broad measures of conscientiousness predict career success and earnings (Judge et al., 1999). Conscientiousness and social responsibility have been linked to greater marital stability (Cramer, 1993; Kelly & Conley; 1987; Tucker, Kressin et al., 1998), which, in turn, predicts longevity (Tucker et al., 1996). Higher levels of social responsibility in childhood predict having more children and belonging to more organizations in adulthood, both of which contribute to increased longevity (Samuelsson & Dehlin, 1994; Tucker et al., 1999). Conscientiousness also is positively related to religiosity (MacDonald, 2000; Taylor & MacDonald, 1999), which, in turn, is associated with diminished substance abuse (Miller, Davis, & Greenwald, 2000) and increased longevity (McCullough, Hoyt, Larson, Koenig, & Thoresen, 2000).

There appears to be ample evidence to support the conclusion that traits from the domain of conscientiousness are related to social-environmental factors and substance-use behaviors. As Friedman (2000) noted, however, few studies have brought personality, social-environmental factors, and health behaviors together in one

study. In the present study, we test the prospective relationship between conscientiousness-related traits and both social environmental variables and substance-use behaviors. Specifically, we focus on scales drawn from the California Psychological Inventory (CPI) that fall into the domain of conscientiousness: Responsibility, Socialization, Self-control, and Achievement via conformance. Although often regarded as measures of the broad conscientiousness domain (Fleenor & Eastman, 1997), these four CPI scales best represent the social responsibility facet of conscientiousness (Deniston & Ramanaiah, 1993; Roberts, 1997). We test the relation of social responsibility to the social-environmental factors of marital stability, divorce, number of children, participation in paid work, and status level of work. In addition, we use social responsibility to predict the substance-use behaviors of tobacco, alcohol, and marijuana consumption. Based on previous research, we expect social responsibility to be positively related to social-environmental factors, such as having more children and marital stability, and negatively related to alcohol, tobacco, and marijuana consumption.

The Longitudinal Relationships Among Social Responsibility, Social-Environmental Factors, and Substance-Use Behaviors

As mentioned before, most previous research on the relationships among personality, social-environmental factors, and substance-use behaviors uses a trait approach in the study design. Traits are used to predict outcomes and are not incorporated in subsequent waves of a longitudinal or prospective study. These studies cannot test whether the long-term pathways that people follow in their lives are associated with changes in personality traits.

The idea that experiences within the social environment are associated with changes in personality is an explicit component of the Adler and Matthews (1994) health-behavior model. In their conceptualization, it is presumed that social-environmental factors and individual differences are reciprocally related, such that experiencing certain social-environmental factors (e.g., poverty or marital stability) may promote systematic change in personality. It is quite plausible that work and family experiences may be related to increases in conscientiousness-related traits. For example, Elder (1969) found that men in similar situations became more confident, emotionally stable, and conscientious. Women who attain a high

status level in work show similar changes in personality traits (Roberts, 1997). More recently, Roberts, Caspi, and Moffitt (2003) found that occupational attainment and work involvement were both associated with increases in the conscientiousness-related trait of constraint in both men and women in young adulthood. Also, Robins, Caspi, and Moffitt (2002) showed that remaining in a stable, monogamous relationship for a longer period of time was associated with increases in constraint in the same sample. It appears that consistent commitment to the social institutions of work and marriage facilitates change in personality traits in general and conscientiousness-related traits in particular.

One possibility not considered in the Adler and Matthews (1994) model is that participation in risky health behaviors would be related to changes in conscientiousness-related traits. For example, Stein, Newcomb, and Bentler (1987) found evidence that alcohol consumption was associated with decreases in conscientiousness-related traits and marijuana consumption was associated with decreases in social conformity.[1] Consistent with the Cumulative Continuity Model of personality development (Roberts & Caspi, 2003), participation in risky health behaviors and exposure to negative social-environmental factors may support and enhance an identity that may be in direct opposition to the normative trend to increase on conscientiousness-related traits with age (Helson & Kwan, 2000; Roberts, Caspi, & Moffitt, 2001; Roberts, Helson, & Klohnen, 2002; Robins, Fraley, Roberts, & Trzesniewski, 2001). In the present study, we test the relationship between the incidence of specific social-environmental factors and substance-use behaviors and change in social responsibility from age 21 to age 43 and from age 43 to age 52. Based on previous research, we hypothesized that consistent investments in the worlds of work and marriage would be related to increases in social responsibility. In contrast, we expected participation in risky health behaviors to be related to decreases in social responsibility.

1. Stein, Newcomb, and Bentler (1987) concluded that their data did not support a reciprocal model. We differ in our reading of their data because we choose to interpret the wave two relationship between alcohol and drug consumption and personality traits as representing the relationship between change in alcohol and drug consumption and change in personality. Stein et al. (1987) focused only on the cross-lagged effects of traits on alcohol and drug consumption and alcohol and drug consumption on traits.

The availability of multiple waves of data across the life course provides the opportunity to test these more nuanced developmental ideas, but also poses formidable analytical challenges. Consistent with previous research (Neyer & Asendorpf, 2001), we employed path analysis in order to test the multiple ways in which social-environmental factors and substance-use behaviors may be associated with changes in social responsibility over time. Path analysis allows one to control for the stable aspects of variables over time while simultaneously testing for change relationships.

Figure 1 shows a representative model that will serve as a basis for our conceptual organization, as well as concrete analyses. In this model, the stable aspects of personality and social-environmental factors and substance-use behaviors are estimated and controlled in the paths labeled as "a," which reflect the autocorrelations over time. The "b" paths reflect the prospective, lagged effect of social responsibility on social-environmental factors and substance-use behaviors at later ages. The first path, b1, is from age 21 social responsibility to age 43 outcomes and the second path, b2, is from age 43 social responsibility to age 52 outcomes. Both of these paths address the question of whether there are prospective, lagged effects of earlier social responsibility on later substance use and social-environmental factors. The second path, b2, represents a more rigorous test of the prospective relationship of social responsibility
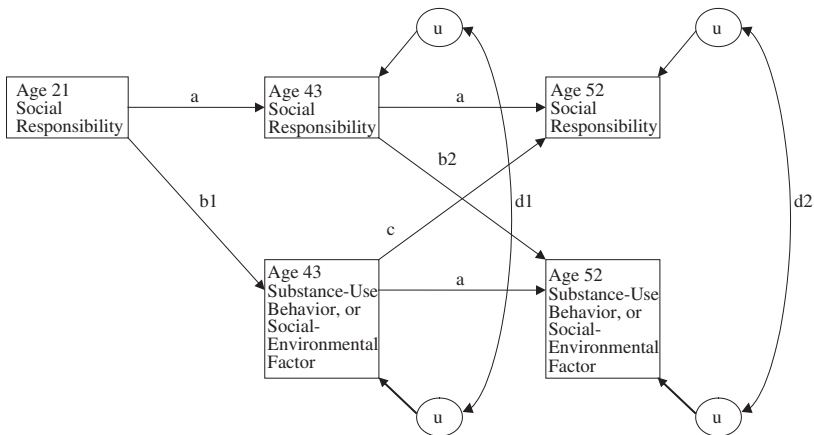

Figure 1

Conceptual and analytical model for analyzing the predictive and change relationships among social responsibility, social-environmental factors, and substance-use behaviors.

because it controls for age 43 social-environmental factors and substance-use behaviors.

The analysis of the relationship between change in social responsibility and social-environmental factors and substance-use behaviors is represented in paths "c" and "d." The "c" paths represent the antecedent effects of social-environmental factors and substance-use behaviors on change in social responsibility from age 43 to age 52. These paths represent the strongest test of a causal relationship between substance use and social-environmental factors and change in social responsibility as the former experiences occur prior to change in social responsibility between age 43 and age 52.

The "d" paths represent the correlations among the path residuals at age 43 and age 52. These residual correlations are used to infer a transaction of change between social responsibility and social-environmental factors or substance-use behaviors, where all antecedent paths before each "d" path are controlled (Neyer & Asendorpf, 2001). The first "d1" path correlation (reading from left to right) is interpreted as the relationship between the change in social responsibility from age 21 to age 43 and social-environmental factors or substance-use behaviors at age 43. The "d2" path correlation is interpreted as the relationship between the changes in social responsibility from age 43 to age 52 and the changes in social environmental or substance-use behaviors from age 43 to age 52. Both "d" paths are explicitly noncausal as it is impossible to know which factor was causally prior in the relationship.

In sum, our analyses will address three questions, (1) Are there prospective, lagged effects of earlier social responsibility on later substance use and social-environmental factors ("b" paths in Figure 1)? (2) Are there prospective, lagged effects of earlier substance use and social-environmental factors on later changes in social responsibility ("c" paths)? And, (3) are there contemporaneous relationships between change in substance use and social-environmental factors and changes in social responsibility ("d" paths)?

METHOD

Participants: The Mills Longitudinal Study

The Mills Longitudinal Study is an ongoing longitudinal study emphasizing the issue of personality development in women. The Mills

sample consists of a representative two-thirds sample ($N = 142$) of the senior class at Mills College in Oakland, California, contacted in 1958 and 1960. The sample is predominantly white and middle class. Follow-ups in 1963–64, 1981, and l989 traced the personality and life events of approximately 100 women (Helson, 1967; Helson, Mitchell, & Moane, 1984; Helson & Wink, 1992). The present study focuses on data drawn from the 1958–60, 1981, and 1989 assessments and the 99 women for whom personality data was available at these three assessments. For some variables, when the sample sizes were lower than 99, mean-substitutions were used to calculate path models.

Measures

Social Responsibility

The primary personality inventory used in the Mills study is the California Psychological Inventory (CPI; Gough & Bradley, 1996). The Responsibility, Socialization, Self-control, and Achievement via conformance scales from the CPI were selected as markers of the conscientiousness-related trait of social responsibility. According to Gough and Bradley (1996), high scorers on the Responsibility scale are described as being reasonable and dutiful; low scorers are described as lazy and careless. High scorers on the Socialization scale are described as conscientious, conventional, and cooperative; low scorers are described as careless, changeable, and cynical. High scorers on the Self-control scale tend to take pride in being self-disciplined; low scorers tend to have strong emotions and feelings, and make little attempt to hide them. High scorers on the Achievement via conformance scale tend to have a strong desire to do well in settings where tasks are clearly defined; low scorers tend not to work well in situations with strict rules.

These four scales were combined into an overall index, which was used in all subsequent analyses.[2] Given the nature of the content and correlates of these scales (e.g., McCrae, Costa, & Piedmont, 1993), this overall index reflects the social responsibility subfacet of conscientiousness described in the introduction, and will be described as such for the remainder of the paper. This inference is supported by ongoing research on the lower-order structure of the trait of conscientiousness. Roberts, Chernyshenko, Stark, & Goldberg (2002) analyzed 36 conscientiousness-

2. The composite variable captured the majority of relationships found when the relationships using the individual scales were tested. Furthermore, the relationships for the individual social responsibility scales showed no systematic pattern with the outcomes, such that each of the four scales was related to some social-environmental and substance-use behaviors at various points in the life course and no one scale distinguished itself as being critical to the overall pattern.

related scales from seven different personality inventories. They found a clear social responsibility factor on which these four CPI scales loaded. In the present study, the composite of scales had an average alpha reliability of .86 across the three waves of assessment used in this study (range from .85 to .86). Furthermore, a principle axis factor analysis of the four scales at age 21, 43, and 52 showed a clear one-factor solution at all ages that accounted for 44% to 50% of the variance in the four scales across age periods.

Social-Environmental Factors: Family
On the demographic questionnaires, the women indicated the number of children they had by age 43 and whether they had divorced between the ages of 21 and 43 or between the ages of 43 and 52 (the latter scored 1 = *ever divorced*, 0 = *never divorced*, for both age periods). We also tabulated the number of years that women were married from age 21 to 43 and from age 43 to 52. From this data we calculated the percentage of time the women were married during these two periods. Marital satisfaction was measured at ages 43 and 52 using a 7-item scale (see Helson & Wink, 1987).

Social-Environmental Factors: Work
The number of years spent in the paid labor force between the ages of 21 and 43 and between the ages of 43 and 52 was tabulated from open-ended descriptions of career history gathered at age 43 and age 52. From this data we calculated the percentage of time the women were in the paid labor force during these two periods. Coders rated status level in paid employment at ages 43 and 52 using information provided by the women about the nature of their work and their job title. This status level measure correlates ($r = .75$) with standard measures of occupational attainment, such as the Hollingshead Two-Factor Index of Social Position and is described in detail in Roberts (1997).

Substance-Use Behaviors
The women completed identical questionnaires related to alcohol, tobacco, and marijuana consumption at age 43 and age 52. The women rated two questions pertaining to alcohol consumption. The first item asked about consumption of wine and beer and was rated on a 7-point scale from 1, *none* to 7, *more than 3 glasses per day*. The women also rated the amount of "other alcohol consumed" on a seven-point scale from 1, *none* to 7, *more than 3 glasses per day*. These two items were combined to form an index of total alcohol consumption. Number of cigarettes smoked was rated on a 7-point scale from 1, *none* to 7, *more than 2 packs per day*. Finally, the women rated the amount of marijuana they used on

a 6-point scale from 1, *never* to 6, *more than daily*. Both the cigarette and marijuana variables were severely skewed given the fact that the majority of the women did not smoke cigarettes or marijuana. Following the guidelines provided by Tabichnick and Fidell (1996), we used an inverse transformation in order to improve the distributions of both variables.

RESULTS

Descriptive Statistics

Table 1 shows the means and standard deviations for all of the variables analyzed in the study across the different waves of assessment. Mean-level changes in the variables tracked for more than one age were evaluated using repeated measures analysis of variance. The mean-level of the social responsibility composite increased with age approximately one-fifth of a standard deviation from age 21 to age 52. The within-subject test of the effect of time, adjusting for the lack of homogeneity of covariance (the correlation from age 21 to age 43 was lower than the correlation from age 43 to age 52, see Table 2) was not statistically significant [*Huynh-Feldt*(2, 196) = 2.2, $p > .05$]. The trend analysis however,

Table 1
Descriptive Statistics and Change Over Time

	Age 21	Age 43	Age 52	*F*
Social Responsibility	212.5 (22.1)	213.7 (21.7)	216.4 (21.7)	2.2
Social-Environmental				
Factors				
Number of children	–	1.7 (1.3)		
% of time married	–	.68 (.33)	.69 (.43)	
Divorced	–	.29 (.45)	.17 (.38)	
Marital satisfaction	–	20.7 (5.3)	21.4 (5.0)	.2
% of time worked	–	.54 (.32)	.65 (.37)	9.8*
Status level of work	–	3.3 (1.9)	3.6 (1.9)	4.3*
Substance Use				
Alcohol consumption	–	5.7 (2.0)	5.1 (2.3)	13.5*
Tobacco consumption	–	1.8 (1.6)	1.4 (1.2)	9.8*
Marijuana consumption	–	1.2 (.5)	1.1 (1.1)	13.6*

Note. *N*s range from 70 (marital satisfaction at age 52) to 125 (status level of work at age 43).

Table 2
Predictive Effects of Social Responsibility on Later Social-
Environmental Factors and Substance-Use Behaviors

	Age 21 Social Responsibility	Age 43 Social Responsibility
Age 43 Social-Environmental Factors		
Number of children	.18*	–
% of time married, 21–43	.21*	–
Divorced, 21–43	– .26*	–
Marital satisfaction age 43	.08	–
% of time worked, 21–43	– .21*	–
Status level of work, 43	– .10	–
Age 43 Substance Use		
Alcohol consumption, 43	.26*	–
Tobacco consumption, 43	– .30*	–
Marijuana consumption, 43	– .28*	–
Age 52 Social-Environmental Factors		
% of time married, 43–52	–	– .04
Divorced, 43–52	–	– .07
Marital satisfaction age 52	–	.33*
% time worked, 43–52	–	– .08
Status level of work, 52	–	– .12*
Age 52 Substance Use		
Alcohol consumption, 52	–	– .09
Tobacco consumption, 52	–	.05
Marijuana consumption, 52	–	– .08

Note. $N = 99$. Coefficients are standardized regression weights taken from path models.
*$p < .05$, one-tailed test.

testing whether there was a linear increase over time [$F(1, 980) = 3.1$] was statistically significant if one assumed a one-tail test.

Within the domain of social-environmental factors, no women had children after age 43 in this sample (precluding an examination of change). The percentage of time married remained virtually unchanged over time. Similarly, marital satisfaction showed no statistically significant normative change [$F(1, 55) = .20, p > .05$]. In contrast, women demonstrated mean-level increases in status level of

work [$F(1, 119) = 4.13$, $p < .05$] and in the percentage of time that they worked in the paid labor force [$F(1, 102) = 9.8$, $p < .05$].

Within the health behavior domain, women decreased their consumption of alcohol from age 43 to age 52 [$F(1, 79) = 13.5$, $p < .05$]. Women also decreased their consumption of cigarettes [$F(1, 83) = 9.8$, $p < .05$] and marijuana [$F(1, 82) = 13.6$, $p < .05$].

Does Social Responsibility Predict Substance Use and Social-Environmental Factors?

Table 2 provides the path coefficients showing the prospective effects of age 21 social responsibility on social-environmental factors and substance-use behaviors at age 43 ("b1" path in Figure 1). It also shows the path coefficients for the antecedent effect of age 43 social responsibility on social-environmental factors and substance-use behaviors at age 52 ("b2" path). All path models were run using AMOS 4.

Consistent with our expectations, social responsibility was related to both social environmental and substance use factors associated with longevity. Women who scored higher on social responsibility at age 21 had more children at age 43 ($\beta = .18$, $p < .05$), were married for more time from age 21 to age 43 ($\beta = .21$, $p < .05$), and were less likely to divorce during this period of the life course ($\beta = -.26$, $p < .05$). Counter to our expectations, age-21 social responsibility predicted spending less time in the paid labor market between age 21 and age 43 ($\beta = -.21$, $p < .05$). One possible explanation for this finding is that the effect of time spent in marriage confounded this path. For example, when included in the path model, percentage of time spent in marriage was strongly and negatively related to percentage of time spent in the paid labor force at age 43 ($\beta = -.49$, $p < .05$). Furthermore, the effect of age-21 social responsibility on age-43 percentage of time spent in the paid labor force was rendered statistically insignificant and reduced from $-.21$ to $-.14$ when the effect of time spent in marriage was held constant in the path model. This indicates that the effect of social responsibility on labor force participation was primarily indirect, such that women who were higher on social responsibility were more likely to marry and stay married and, consequently, to work less than other women.

In relation to substance use, as hypothesized, social responsibility at age 21 was negatively related to tobacco ($\beta = -.30$, $p < .05$) and

marijuana consumption at age 43 ($\beta = -.28$, $p < .05$). In contrast, and counter to our expectations, social responsibility at age 21 was positively related to consuming more alcohol at age 43 ($\beta = .24$, $p < .05$).

There were fewer predictive paths from age-43 social responsibility to age-52 factors. Social responsibility at age 43 predicted greater marital satisfaction at age 52 ($\beta = .33$, $p < .05$), and lower status level of work at age 52 ($r = -.12$, $p < .05$). Social responsibility at age 43 did not predict substance use patterns at age 52.

The different pattern of results between the b1 and b2 paths for substance-use behaviors indicates that other factors may be affecting the pattern of relationships. The most salient difference is that the b1 paths do not include prior substance-use behaviors. It is possible that if included at age 21, these substance-use behaviors would reduce the magnitude of the prospective relationships for the b1 paths. A second possibility has to do with the fact that effects are drawn from different stages of life. The general reduction in the number and size of effects at age 43 may reflect the increasing stability of both social responsibility and social-environmental factors and substance-use behaviors.

Are Social-Environmental Factors and Substance-Use Behaviors Prospectively Associated With Changes in Conscientiousness-Related Traits?

The most powerful test of whether social environmental and substance use factors affect change in social responsibility is reflected in the prospective relationships from age-43 factors to changes in social responsibility from age 43 to 52. The results for these paths, represented as the "c" path in Figure 1, are shown in Table 3. Two family factors were associated with changes in social responsibility prospectively. Percentage of time spent married between age 21 and age 43 predicted increases in social responsibility from age 43 to age 52 ($\beta = .13$, $p < .05$), indicating that women who were married longer from age 21 to age 43 tended to increase in social responsibility from age 43 to age 52. Conversely, experiencing divorce by age 43 was prospectively related to decreases in social responsibility from age 43 to age 52 ($\beta = -.14$, $p < .05$). In addition, two work factors were associated with changes in social

Table 3

Prospective Relationship Between Social-Environmental
Factors and Substance-Use Behaviors and Changes in Social
Responsibility

	Change in SR from 43 to 52
Age 43 Social-Environmental Factors	
Number of children	.02
% of time married, 21–43	.13*
Divorced, 21–43	− .14*
Marital satisfaction age 43	.09
% of time worked, 21–43	− .11*
Status level of work, 43	− .12*
Age 43 Substance Use	
Alcohol consumption, 43	.10
Tobacco consumption, 43	− .07
Marijuana consumption, 43	− .17*

Note. $N = 99$. Numbers are path coefficients (age-43 variables predicting change in
social responsibility from 43 to 52).
*$p < .05$, one-tailed test.

responsibility prospectively. The percentage of time spent in the
paid labor force from age 21 to age 43 and status level of work at
age 43 predicted decreases in social responsibility from age 43 to age
52 ($\beta = - .11$, $p < .05$ and $\beta = - .12$, $p < .05$, respectively). Consis-
tent with the prospective findings, when the effect of time spent
in marriage was controlled for, the effect of percentage of time
spent in the paid labor force was reduced to − .07 and was not
statistically significant. Including percentage of time married
in the path model did not affect the results for age-43 status level
in work.

Of the substance use factors, marijuana consumption at age 43
was negatively related to changes in social responsibility prospec-
tively, from age 43 to age 52 ($\beta = - .17$, $p < .05$). Thus, women who
admitted to smoking marijuana at age 43 were more likely to
decrease in social responsibility between ages 43 and 52. Clearly,
both social-environmental factors and substance-use behaviors
demonstrated prospective relationships with change in social
responsibility.

Are Social-Environmental Factors and Substance-Use Behaviors Contemporaneously Associated With Changes in Conscientiousness-Related Traits?

A less definitive, but still interesting analysis is to test the contemporaneous relationships between social-environmental and substance-use factors and changes in social responsibility (see Table 4). These relationships are labeled ''d1'' and ''d2'' in Figure 1 and reflect the correlated residuals at age 43 and age 52, respectively. As mentioned before, these coefficients are interpreted in a strict

Table 4
Contemporaneous Relationships Between Changes in Social Responsibility and Social-Environmental Factors and Substance-Use Behaviors

	Change in SR from 21 to 43	Change in SR from 43 to 52
Age 43 Social-Environmental Factors		
Number of children	.15	–
% of time married, 21–43	.08	–
Divorced, 21–43	.11	–
Marital satisfaction age 43	.22*	–
% of time worked, 21–43	− .10	–
Status level of work, 43	.10	–
Age 43 Substance Use		
Alcohol consumption, 43	− .15	–
Tobacco consumption, 43	− .20*	–
Marijuana consumption, 43	− .34*	–
Age 52 Social-Environmental Factors		
% of time married, 43–52	–	.18*
Divorced, 43–52	–	− .04
Marital satisfaction age 52	–	− .05
% time worked, 43–52	–	.03
Status level of work, 52	–	.14
Age 52 Substance Use		
Alcohol consumption, 52	–	− .06
Tobacco consumption, 52	–	− .07
Marijuana consumption, 52	–	.06

Note. $N = 99$. Numbers are path coefficients.
*$p < .05$, one-tailed test.

correlational sense. The causal direction is unknown. Three coefficients were statistically significant at age 43. Women who increased in social responsibility from age 21 to age 43 were more satisfied in their marriage at age 43 ($\beta = .25$, $p < .05$). Of the three age-43 substance-use behaviors, tobacco consumption was related to decreases in social responsibility from ages 21 to 43 ($\beta = -.20$, $p < .05$) as was marijuana consumption ($\beta = -.34$, $p < .05$).

Next, we examined the second d2 paths, in which we tested the relationship between changes in social responsibility and changes in social-environmental factors and substance-use behaviors from age 43 to age 52. Only one social-environmental factor—increases in percentage of time married—was associated with increases in social responsibility from age 43 to age 52 ($\beta = .18$, $p < .05$), a finding consistent with those reported by Robins et al. (2002) for young adults.[3] The contemporaneous paths supported the hypothesis that investing in conventional social roles, such as marriage, is associated with increases in social responsibility, whereas participating in risky substance-use behaviors is associated with decreases in social responsibility.

Simultaneous Modeling of Social-Environmental Factors, Substance-Use Behaviors, and Social Responsibility

Finally, we constructed a path model in order to test whether the social environmental and substance-use behaviors most consistently related to social responsibility were independently and reciprocally related to social responsibility over time. Figure 2 shows a manifest variable path model in which the 30-year relationships among social responsibility, time spent in marriage, and marijuana consumption are depicted. Only the paths with statistically significant effects are shown. The model fit the data well [Chi-square(11) = 8.6, $p > .05$, NFI, RFI, and CFI all $> .99$], as would be expected from a model that is close to fully saturated.

3. Previous research has shown that these CPI scales correlate with measures of neuroticism, which could confound the results. We ran all analyses reported in Tables 2, 3, and 4 holding constant the Taylor Manifest Anxiety scale from the MMPI at age 21. None of the effects were changed substantively (i.e., those that were statistically significant remained statistically significant). Over 50% of the effects remained exactly the same. The majority of the remaining effects moved up or down approximately one one-hundredth of a point.
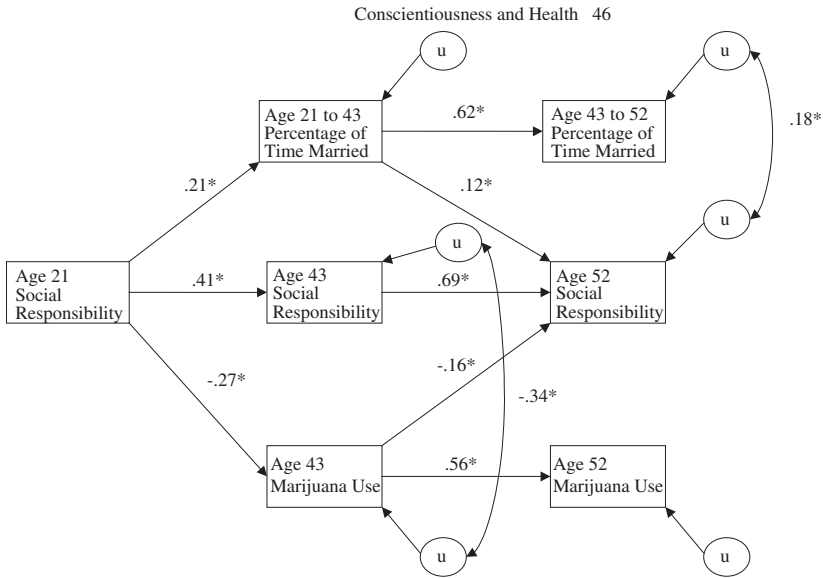
Figure 2
Path model showing reciprocal relationship between social responsibility, marijuana consumption, and marital stability from age 21 to age 52. Coefficients are standardized path coefficients.
*p<.05, one-tailed test.

Consistent with our hypotheses, social responsibility was positively related to spending more time in the institution of marriage from age 21 to age 43. Conversely, social responsibility at age 21 was negatively correlated with the consumption of marijuana at age 43. In turn, both the percentage of time spent in marriage and smoking marijuana had reciprocal relations with social responsibility. Specifically, women who remained in marriages longer in young adulthood tended to increase in social responsibility from age 43 to age 52. Moreover, spending more time in marriage from age 43 to age 52 was associated with changes in social responsibility from age 43 to age 52 (the contemporaneous relationship). Marijuana consumption counteracted the effect of being married such that smoking marijuana at age 43 predicted decreases in social responsibility from age 43 to age 52 and was associated with decreases in social responsibility from age 21 to age 43. This model demonstrates that social responsibility predicts important social-environmental and substance-use factors and that both classes of

variables were independently related to differential patterns of development in social responsibility.

DISCUSSION

In the present study, we tested how social responsibility was related to social-environmental factors and substance-use behaviors in a sample of college-educated women from age 21 to age 52. Adding to the findings of previous research, we found that the trait of social responsibility assessed in young adulthood predicted social-environmental factors and behaviors known to affect health assessed in midlife. We also found that tobacco and marijuana consumption and several social-environmental factors, such as spending more time in marriage and work, were related to changes in social responsibility both concurrently and prospectively.

The Predictive Relationship Between Social Responsibility and Social-Environmental Factors and Substance-Use Behaviors

The predictive correlations between social responsibility and social-environmental factors and substance-use behaviors revealed a pattern in which women high on social responsibility invested in conventional social institutions and abstained from harmful substance-use behaviors. Within the family domain, social responsibility was positively associated with having more children by age 43, spending more time in marriage from age 21 to age 43, and not experiencing divorce from age 21 to age 43. A stable family unit has proven to be a powerful predictor of positive health outcomes, such as longevity (Samuelsson & Dehlin, 1994; Tucker et al., 1999). Given its antecedent relationship to family factors, the conscientiousness-related trait of social responsibility may prove to be an important individual difference factor predisposing certain individuals to a longer and healthier life through the way they structure their social environment.

We also expected that social responsibility, as a facet of conscientiousness, would be positively related to work outcomes such as occupational attainment. This expectation was not met. In fact, women who scored higher on social responsibility were less likely to participate in the paid labor force from age 21 to age 43 and from age 43 to age 52. Subsequent analyses showed that this

negative effect was accounted for by the positive relationship of social responsibility to marriage. Women who married and remained married were much less likely to participate in the paid labor force. When the path between time spent in marriage and labor force participation was controlled for, the negative prospective relationship of social responsibility to time spent in the labor force was greatly reduced.

Consistent with our hypotheses, we also found predictive correlates of substance-use behaviors. Women who scored higher on social responsibility in college were less likely to smoke tobacco and marijuana at age 43. We suspect that the magnitude of the correlation between social responsibility at age 43 and marijuana consumption at age 52 was constrained by the distribution of marijuana consumption, which was quite skewed because of the limited number of women who admitted to the behavior at that time. We did find one relationship that was counter to our expectations. Women who scored higher on social responsibility at age 21 admitted to drinking more alcoholic beverages at age 43. This counterintuitive finding may reflect the fact that there were very few women in the Mills sample who truly abused alcohol. Thus, this finding reflected the relationship between social responsibility and moderate levels of alcohol consumption. Drinking in moderation may have been more socially acceptable and therefore normative, which may explain the positive association in this sample.

Setting aside the two anomalous findings, we found overall support for the positive role of social responsibility in the health process, though this role appears to be stronger in young adulthood than midlife. The prospective effects of social responsibility decreased with age as the b1 paths were systematically larger and more common than the b2 paths, especially in the case of substance-use behaviors. The most parsimonious explanation for the decrease is that the b1 paths do not include prior substance-use behaviors, so the effects may reflect an overestimate of the effect of social responsibility. Another possibility is that the effects are drawn from different stages of life, and the general reduction in the number and size of effects at age 43 may reflect the increasing stability of both social responsibility and social-environmental factors and substance-use behaviors. Therefore, the role of social responsibility in the health process may be more significant earlier, rather than later in life.

Future research should pursue the mediators and mechanisms that explain these relationships. For example, individuals high in social responsibility may appraise and cope with stressful events differently than people low in social responsibility, and these differences in coping strategies may affect whether they have different expectancies concerning health behaviors (e.g., Finn, Sharkansky, Brandt, & Turcotte, 2000). Furthermore, social responsibility may affect the way people perceive health behaviors, rendering some behaviors more risky and thus, less appealing (Hampson et al., 2000). Finally, the apparent effect of social responsibility on family and work experiences may be mediated by attitudinal factors such as conservatism, which would presumably be related to both social responsibility and outcomes like having more children.

Is Change in Social Responsibility Related to Social-Environmental Factors and Health Behaviors?

Our second question concerned the transactions between social responsibility and the social environmental and substance-use behaviors that affect health and longevity. Specifically, we asked whether changes in social responsibility were related to each of the substance-use behaviors and social-environmental factors. These relationships are theoretically interesting because, if significant, they would demonstrate the existence of specific factors associated with changes in personality traits in periods of the life course normally thought to be dominated by stability and lack of change (McCrae & Costa, 1994). In addition, such transactions would point to a more robust link between health behaviors and psychological development, meaning that adopting certain health behaviors would be associated with specific patterns of personality development. Finally, it is compelling because if people improve their scores on conscientiousness-related traits, this may contribute to more positive health outcomes later in life.

We found several associations that were consistent with our hypotheses derived from previous research and theory. For example, being positively invested in the institution of marriage was associated with increases in social responsibility. Specifically, women who were more satisfied with their marriage at age 43 increased in social responsibility from age 21 to age 43. Furthermore, being married for a greater proportion of time and not getting

divorced between age 21 and age 43 and being married for a greater proportion of time between age 43 and age 52 were associated with increases in social responsibility, even from age 43 to age 52. Several of these findings were especially provocative because they were prospective in nature. That is, the life experience preceded the change in personality. They also were significant because they occurred during an age period well beyond the purported age at which personality is set like plaster (Costa & McCrae, 1994).

Consistent with our hypotheses drawn from the Cumulative Continuity Model, participating in specific substance-use behaviors was associated with differential patterns of change in social responsibility. Specifically, tobacco and marijuana consumption at age 43 were negatively correlated with changes in social responsibility between age 21 and age 43. Furthermore, marijuana consumption at age 43 predicted changes in social responsibility from age 43 to age 52. One implication of the relationship between tobacco and marijuana consumption and changes in social responsibility is that there are cumulative disadvantages beyond simply participating in deleterious substance-use behaviors. That is, individuals who consume these substances may become less socially responsible, which, in turn, may increase the probability that they engage in other risky health behaviors later in life or fail to discontinue risky behaviors.

The picture one draws from these findings is consistent with Runyan's (1978) sequential interactionist conceptualization of the life course, which emphasizes the interplay between dispositions within the person, behaviors (e.g., consuming drugs), and situations to which they are exposed (e.g., divorce). Generally, women who scored lower on social responsibility had nonnormative experiences, such as divorce, and participated in norm-questioning behaviors, such as marijuana consumption. In turn, these nonnormative experiences were prospectively related to decreases in social responsibility over time. These findings clearly support the sequential interactionist perspective, which emphasizes the need to assess and understand the relationships among the elements of personality, behavior, and situation over time, in order to maximize our ability to predict the life path that a person will follow. Therefore, simplistic essentialist/dispositional perspectives that posit traits as static and acting only as causal entities (McCrae, Costa, Ostendorf et al., 2000) would only weakly account for health

outcomes, as would contextual models (Lewis, 1999) that ignore personality traits altogether.

Like the predictive relationship between social responsibility and health behaviors, the relationships between social-environmental factors and drug consumption and changes in social responsibility raise many provocative questions. For example, what are the mechanisms through which these experiences influence change in conscientiousness-related traits? Is it a question of self-consistency (Bem, 1972), in which persons observe themselves behaving in a nonnormative fashion (e.g., smoking marijuana) and then conclude that they are not responsible or self-controlled? Or, does drug consumption lead to more impulsive behaviors that directly translate into changes in underlying personality structure? A third possibility, as Roberts and Caspi (2003) have proposed, is that these people saw drug consumption as part of their identity as a nonconformer. Through attempts to maintain their nonconforming identity, they purposefully engaged in behaviors like drug consumption that supported or extended their nonconforming self-concept. These questions and ideas need to be pursued in more targeted longitudinal research in which both personality and health-related factors are assessed and the mechanisms that drive their relationships are tested.

Implications, Limitations, and Conclusions

The results presented in this study are unique for several reasons. First, there are very few studies that demonstrate predictive relationships between personality and substance-use behaviors that stretch over 20- and 30-year periods. Second, this is one of the first studies to demonstrate that the social-environmental factors and substance-use behaviors associated with longevity also are associated with changes in the traits that are linked to longevity. Despite the significance of these findings, the study suffers from clear limitations. The sample used for this study was composed of women. Accordingly, we do not know whether the relations will replicate in a sample of men. An analogous study comprised of both women and men would be an invaluable replication and extension. Furthermore, the sample was bound by a specific historical period. Undoubtedly, the increased social acceptance of drug consumption in the 1960s and 1970s made possible the negative relationship between social

responsibility and marijuana consumption. In cohorts even 10 years prior to the Mills sample, the base rate of marijuana consumption would have been so low as to preclude a correlation. Finally, the sample was relatively small, limiting our ability to definitively test relationships among the variables of focus.

In the present study, we have shown that the conscientiousness-related trait of social responsibility predicted family and work outcomes and substance-use behaviors that are known to affect health and longevity. Yet, to date, the personality trait of conscientiousness has not received the attention that other dispositions such as hostility and depression have in the personality and health literature (Contrada, Cather, & O'Leary, 1999; Friedman, 2000; Weibe & Smith, 1997). This can, in part, be attributed to the relatively recent nature of the Big Five taxonomy of traits (Goldberg, 1993). It also is the result of the assumption of some researchers that personality traits do not predict behavior; therefore they will not predict health behaviors (e.g., Weibe & Smith, 1997). This is apparently a premature conclusion at best and an incorrect assumption at worst. If the relationship between conscientiousness-related traits and substance-use behaviors replicates across studies, it may turn out that conscientiousness plays one of the most significant roles in predicting who is healthy and who is not.

Finally, we demonstrated that participating in certain social institutions (work and marriage) and certain health behaviors was associated with changes in social responsibility. These findings highlight the importance of tracking both personality and health factors longitudinally. Simply assuming that personality traits do not change and should only be used as prospective predictors of outcomes is incorrect and leaves half the story untold. More importantly, the reciprocal relationship between these factors may facilitate changes in health-relevant traits that may add or subtract years from life.

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