Is Personality Associated with Health Care Use by Older Adults?

BRUCE FRIEDMAN,[1] PETER J. VEAZIE,[1] BENJAMIN P. CHAPMAN,[1] WILLARD G. MANNING,[2] and PAUL R. DUBERSTEIN[1]

[1]*University of Rochester;* [2]*University of Chicago*

Context: The patterns of health care utilization in the United States pose well-established challenges for public policy. Although economic and sociological research has resulted in considerable knowledge about what influences the use of health services, the psychological literature in this area is underdeveloped. Importantly, it is not known whether personality traits are associated with older adults' use of acute and long-term care services.

Methods: Data were collected from 1,074 community-dwelling seniors participating in a Medicare demonstration. First they completed a self-report questionnaire measuring the "Big Five" personality traits: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. During the next two years, the participants maintained daily journals of their use of health care services. We used regression models based on the Andersen behavioral model of health care utilization to test for associations.

Findings: Our hypothesis that higher Neuroticism would be associated with greater health care use was confirmed for three services—probability of any emergency department (ED) use, likelihood of any custodial nursing home use, and more skilled nursing facility (SNF) days for SNF users—but was disconfirmed for hospital days for those hospitalized. Higher Openness to Experience was associated with a greater likelihood of custodial home care use, and higher Agreeableness and lower Conscientiousness with a higher probability of custodial nursing home use. For users, lower Openness was associated with more ED visits and SNF days, and lower Conscientiousness with more ED visits. For

Address correspondence to: Bruce Friedman, Department of Public Health Sciences, University of Rochester, 265 Crittenden Blvd, CU 420644, Rochester, NY 14642-0644 (email: Bruce_Friedman@urmc.rochester.edu).

many traits with significant associations, the predicted use was 16 to 30 percent greater for people high (low) versus low (high) in specific traits.

Conclusions: Personality traits are associated with Medicare beneficiaries' use of many expensive health care services, findings that have implications for health services research and policy. Accordingly, person-centered interventions, population-based translational effectiveness programs, and other personalized approaches that leverage the profound advances in personality psychology in recent decades should be considered.

Keywords: health policy, health services research, personality, nursing homes, home care services.

P ATTERNS OF HEALTH CARE UTILIZATION IN THE UNITED STATES pose well-established challenges to public health and national fiscal solvency. Although economic and sociological research has resulted in considerable knowledge about what influences health services use, the psychological literature on utilization is underdeveloped. It is known that health behaviors (Roberts, Walton, and Bogg 2005), overall disease burden (Chapman, Lyness, and Duberstein 2007), and other factors that *predispose* people to use health services are associated with personality, but it has not yet been established whether, in fact, personality traits are associated with older adults' use of health care. For this article we examined associations between personality and some of the most expensive acute and long-term care services used by Medicare beneficiaries. Here personality is defined as "an individual's unique variation on the general evolutionary design for human nature, expressed as a developing pattern of dispositional traits, characteristic adaptations, and integrative life stories complexly and differentially situated in culture" (McAdams and Pals 2006, 212). We focus on one element of personality, dispositional traits, defined as stable patterns of behaving, thinking, and feeling.

Health care costs are a major concern in the United States because they account for a larger proportion of the gross domestic product (GDP) (Aaron and Ginsburg 2009) than that of other advanced industrialized nations (Farrell et al. 2008; Squires 2011), with arguably little additional health benefit. Moreover, per-person health care expenditures in the United States are by far the highest in the world. In fact, at $7,960 per capita in 2009, they are about 2.5 times greater than the average of $3,223 for the thirty-five Organization for Economic Cooperation

and Development nations (OECD 2011). U.S. health care spending reached $2.7 trillion in 2011, or 17.9 percent of GDP, $8,680 per person (Hartman et al. 2013). Government spending accounted for 45.0 percent of total health care spending, of which 61.3 percent, or $744.6 billion, was federal government expenditures (Hartman et al. 2013). Medicare spending totaled $554.3 billion, or $11,610 per enrollee (Hartman et al. 2013).

In addition to controlling price, understanding the other nonfinancial determinants of health care utilization patterns is essential to addressing the long-term fiscal imbalance in the federal budget, with the accelerating growth in Medicare and Medicaid projected to account for much of that imbalance. It is not reasonable, however, to expect significant modifications in patterns of health care utilization (and the associated costs) without understanding what drives utilization. Paying little heed to personality, earlier attempts to identify the determinants of health care use (Farrell et al. 2008; Ginsburg 2008) have had little discernible positive impact on use and costs.

Individuals' use of goods or services is partially influenced by what economists term *preferences* or *taste*. For example, the pursuit of higher education is now known to be tied to preferences that reflect long-standing personality traits (Borghans et al. 2008). Might different personality traits also lead to the underuse, misuse, and overuse of health services? There is a large literature on implications of patient personality for subjective (Duberstein et al. 2003) and objective measures of health (Chapman, Lyness, and Duberstein 2007), as well as for longevity (Chapman et al. 2010; Chapman, Roberts, and Duberstein 2011). There also is some research on the effects of the physician's personality (Duberstein et al. 2008) and theoretical speculation about the implications of both the patient's and the physician's personality for health services (Epstein et al. 2005; Mead and Bower 2000). That said, however, the relatively large literature on innovations to improve the effectiveness, efficiency, and equity of health care utilization (e.g., American Academy of Family Physicians et al. 2007; Davis, Schoenbaum, and Audet 2005; Rosenthal 2008) has ignored the role of personality.

Two stumbling blocks have hindered the integration of personality science with health services research and policy. First, until the mid-1980s the study of personality was deemed more an art than an orderly, cumulative science. Indeed, many personality theorists avoided empirical inquiry entirely. One psychoanalyst aptly summarized the prevailing

attitude when he admitted that he was "singularly uninterested in, if not contemptuous of, anything that the number crunchers have to say" (Tansey 1992, 539). Meanwhile, the number crunchers did little to improve their standing, filling the pages of scientific journals with studies of traits, personality processes and disorders, motives, goals, and more. The resulting literature was "scattered, balkanized into autonomous regions of inquiry" (McAdams and Pals 2006, 205).

Order has now been imposed (McAdams and Pals 2006). A prominent psychologist's challenge to the legitimacy of personality science (Mischel 1968) was forcefully rebutted by laboratory research (Epstein 1979) and by observational studies documenting strong associations between personality and important life outcomes (Costa and McCrae 1980). Factor analyses of lists of trait-words (e.g., *anxious*, *intellectual*, *dependable*) found in languages worldwide led to a strong consensus that these words can be grouped into five broad domains, the "Big Five," which have been given different labels (Goldberg 1993; McCrae and Costa 1997). In this article, we use the labels *Neuroticism*, *Extraversion*, *Openness to Experience*, *Agreeableness*, and *Conscientiousness*.

- *Neuroticism* refers to the tendency to experience negative emotions such as anxiety, anger, depression, and self-consciousness.
- *Extraversion* is the tendency to experience positive emotions and the desire to socialize.
- *Openness to Experience* refers to the tendency to be drawn to novel ideas, feelings, values, actions, and sensations.
- *Agreeableness* refers to one's attitudes toward others. Agreeable people are acquiescent, trusting, compliant, and compassionate.
- *Conscientiousness* refers to the tendency to prioritize goals and dependably strive toward their competent attainment in a disciplined and orderly fashion.

A second stumbling block to the integration of personality science and health services research and policy was the assumption that because personality traits are temporally stable, they are immutable. It is now known that this assumption is wrong, on two counts. First, personality can change throughout the life span (Roberts, Walton, and Viechtbauer 2006), including in older adulthood (Specht, Egloff, and Schmukle 2011). Second, there is evidence that interventions can modify personality traits (Jackson et al. 2012) and can also be customized for trait-driven thoughts and behaviors associated with adverse health

outcomes and health care utilization patterns in older adults (Davidson et al. 2007).

Recently, the health and policy implications of potential interventions aimed at modifying personality or customizing interventions to older adults have generated some discussion (Chapman, Hampson, and Clarkin in press; Chapman, Roberts, and Duberstein 2011). If personality can be shown to be associated with the utilization of health care, innovations aimed at enhancing the efficiency of the health care system may be able to leverage these recent advances in personality psychology.

Whereas order has been imposed on the personality literature only recently, the health services literature has benefited from an organizing frame for more than forty years. Since its inception in the late 1960s, the most widely used theoretical framework employed to examine the utilization of health care services has been the Andersen behavioral model (Andersen 1968, 1995; Andersen and Newman 1973). Even though the model has been modified and expanded, all versions have included three categories of individual or family determinants that directly affect health services use: (1) predisposing characteristics such as demographics, social structure, values concerning health and illness, attitudes toward health services, and knowledge about disease; (2) enabling factors, for example, income and health insurance; and (3) illness level or need, that is, perceived and evaluated health status. There is impressive evidence of this model's utility in research on many types of health care services, including those that we investigated in this article (e.g., Kempen and Suurmeijer 1991; Lin et al. 2006; Parboosingh and Larsen 1987).

When Ronald Andersen developed his model in the 1960s, personality scholarship had been under attack (Mischel 1968) and was viewed by many as not sufficiently grounded in science. Personality characteristics now, however, are known to be related to all three of the model's major determinants of health care use. For example, personality is associated with education (Borghans et al. 2008), health beliefs and attitudes (Saklofske et al. 2007), risk assessments (Hampson et al. 2000), health care decision making (Flynn and Smith 2007), and health behaviors (Roberts, Walton, and Bogg 2005) (all of these are predisposing characteristics); social network size (von Dras and Siegler 1997) (an enabling factor); and medical morbidity (e.g., Chapman, Lyness, and Duberstein 2007; Duberstein et al. 2011) (illness level or need). But virtually no research based on the Andersen model has included personality traits. The only exception of which we are aware is an earlier study by several of us on emergency department (ED) use (Chapman et al. 2009). Given

our interest in personality as a likely individual determinant of health care use, for this article we concentrated on the individual determinants component of the behavioral model.

Associations of personality traits with health care use have been found in eleven studies, most of which report a relationship with mental health services use (Goodwin et al. 2002; Hopwood et al. 2008; Issikatis and Andrews 2002; Parslow and Jorm 2000; ten Have et al. 2005, 2006). For other health care services, studies found associations of Neuroticism with medication use (van Hemert et al. 1993) and physician treatment (van Hemert et al. 1993); Extraversion with ED use (Chapman et al. 2009) and hospitalization (Nettle 2005); Openness with complementary and alternative medicine (Honda and Jacobson 2005) and comprehensive health checkups (Iwasa et al. 2009); and Agreeableness with ED use (Chapman et al. 2009).

Most other health services have not yet been studied. Few studies have included all the "Big Five" traits, and only two studies focused solely on older persons (age sixty-five and older in Chapman et al. 2009 and age seventy and older in Iwasa et al. 2009). Few studies were carried out in the United States: only Goodwin and colleagues (2002) for mental health services, Honda and Jacobson (2005) for complementary and alternative medicine, and Chapman and colleagues (2009) for ED use. All but two (Nettle 2005; ten Have et al. 2005) failed to examine the amount of use and concentrated instead on any use.

Our study examined whether the Big Five personality traits were associated with seven expensive acute and long-term care services—ED, hospital inpatient, rehabilitation hospital, skilled and custodial nursing home, and skilled and custodial home care utilization—in a sample of U.S. Medicare beneficiaries aged sixty-five years and older with disabilities and recent significant health care use.

Our two research questions were the following: (1) Which personality traits, if any, are associated with older adults' use of these expensive acute and long-term care services? (2) For those older adults with some use of a particular service, which personality traits, if any, are associated with the amount of service use?

We tested directional hypotheses for Neuroticism and Extraversion, two traits that have been studied more extensively than the other Big Five traits, with research supporting directional hypotheses.

We hypothesized that higher Neuroticism would be associated with a greater use of the seven services. This hypothesis is based on considerable evidence that individuals higher in Neuroticism use more mental health

services (Goodwin et al. 2002; Hopwood et al. 2008; Issikatis and Andrews 2002; Parslow and Jorm 2000; ten Have et al. 2005, 2006), are more likely to seek care for perceived ailments (Costa and McCrae 1987), and are more prone to distress and worry, which could lead them to utilize services as a means of seeking reassurance. People high in Neuroticism also are more likely to complain to others in their social network about various ailments, and these supports may encourage more use.

We expected that higher Extraversion would be associated with greater ED use. This expectation was driven by our finding in another sample that higher Extraversion was associated with a greater probability of any ED use (Chapman et al. 2009). We did not formulate directional hypotheses for the other six services because the evidence is contradictory. Greater Extraversion has been found to be associated with more use of some types of health care (Chapman et al. 2009; Nettle 2005) but with less use of others (Goodwin et al. 2002; Honda and Jacobson 2005).

Methods

Study Design

Our study is a secondary analysis of data collected for a randomized controlled trial, the Medicare Primary and Consumer-Directed Care (PCDC) Demonstration (Friedman et al. 2009). The main purpose of the demonstration (1998 to 2002) was to examine the feasibility and effectiveness of a home-visiting nurse intervention and a consumer-directed voucher. The study subjects were randomly assigned to one of four groups: the nurse intervention, the voucher, the combination of the nurse intervention and the voucher, and a control group. An earlier report showed that the nurse intervention resulted in less dependence in activities of daily living compared with the control group twenty-two months after the study's baseline (Friedman et al. 2009).

The Centers for Medicare and Medicaid Services (CMS) approved and funded the demonstration. The University of Rochester Research Subjects Review Board approved the demonstration and our study, which was funded by the National Institute on Aging.

Study Setting and Population

Participants were recruited in eight counties in western New York State (NY, $n = 1,081$) and eleven counties in West Virginia and Ohio

(WV/OH, $n = 524$). Participants or informants (for participants who were cognitively impaired) provided informed consent for the demonstration. The study was designed to enroll people at elevated risk for health care costs. The demonstration inclusion criteria required that study subjects be living in the community rather than a nursing home or other institution, have disabilities (need or receive help with at least two activities of daily living [ADLs] or three instrumental ADLs), and have recently used a significant type of health care service (hospital, nursing home, or Medicare home health care use during the past year, or two or more ED visits in the prior six months). A total of 1,605 patients entered the demonstration.

Personality data were not collected from participants who failed a brief cognitive screen ($n = 247$), out of concern that they might provide unreliable information. The cognitive screen assessed word repetition (*book*, *watch*, and *table*), five-minute word recall, and nonresponse to basic questions about subjective health status, functional status, and life satisfaction. We excluded an additional 284 subjects because they were either under age sixty-five ($n = 164$), had failed the cognitive screen but had mistakenly been administered the personality questionnaire ($n = 51$), did not report answering the personality questions honestly and accurately ($n = 32$), or for various other reasons ($n = 37$) (Weiss et al. 2005). Accordingly, our study investigated 1,074 subjects.

Theoretical Model

In addition to personality traits, our theoretical model included independent variables representing each of the three categories of the Andersen behavioral model (Andersen 1995; Andersen and Newman 1973): (1) predisposing characteristics, (2) enabling factors, and (3) need variables (see appendix 1 for operational definitions and appendix 2 for descriptive statistics).

Measurements

Personality. The patients completed the NEO-Five Factor Inventory (NEO-FFI) (Costa and McCrae 1992), a widely used and validated sixty-item self-report questionnaire that measures Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness.

In this study sample, the internal consistency reliabilities (Cronbach's alphas) are .81, .62, .54, .69, and .75, respectively (Weiss et al. 2005).

Health Care Utilization. The daily use of thirty different services was recorded in health care services journals by the patients and/or their caregivers. Field data collectors monitored the data collection and made home visits to collect the journals, every two months for most study participants. For some participants (e.g., those who had difficulty writing) the field data collectors made weekly visits and completed the journals as directed by the participants. Data on health care services use were available for 99.4 percent (137,905 of 138,719) of the person-weeks that the participants were in the demonstration. Data on hospital, rehabilitation hospital, SNF, and custodial nursing home use were verified by the facilities after initially being identified in the journal. All thirty services had thresholds above which the verification was carried out. Each service had a different threshold, for example, for more than six ED visits during a six-month period. If the self-report data were outside the threshold, the data were verified with the provider and then corrected if necessary. Consistency of service use was also examined, for example, to make sure there were no home care visits when the study subject was a hospital inpatient.

Key Outcome Measures

The following two categories of dependent variables were used for each of the seven health care services listed at the beginning of this article: (1) an indicator of any use and (2) the amount of use conditional on there being some use.

Data Analysis

We first estimated the unadjusted associations between each of the five personality traits and the seven types of health care use, using Spearman correlations for whether there any use and Pearson correlations for the amount of use for those subjects who had some use. We then estimated the adjusted associations using regression models, first adjusting for study features (demonstration intervention group, study site, and number of days in the demonstration) and then adding variables included in the Andersen behavioral model. For any use we first estimated

heteroscedastic probit regression to determine whether the data-generating process differed between the two sites (NY and WV/OH). If not, we then used binary logistic regression to assess the adjusted association between the personality domains and each type of health care service. To assess the adjusted association between personality and each type of service use for those persons who had any use of that type, we used Generalized Linear Models (a gamma distribution with a log link, and an inverse Gaussian distribution with a log link), zero-truncated negative binomial regression with mean dispersion and with constant dispersion, and maximum likelihood mixture models. Standard goodness-of-fit tests were used. Robust clustered standard errors were employed to account for nesting of study participants within physician practices. The patient was the unit of analysis. Statistical significance tests ($\alpha = 0.05$) were one-tailed for the directional hypotheses (Neuroticism for all seven services and Extraversion for ED use) and were two-tailed for the identification of associations. For the significant associations between individual personality traits and either any use or the amount of use, the predicted probability or amount of use was calculated from the regression equation. The 95 percent confidence intervals (CI) were then generated from t tests comparing the predictions below one standard deviation (SD) below the mean prediction with the predictions above one SD above the mean. Stata versions 9 and 12 were used.

Results

Characteristics of Study Subjects

As appendix 2 shows, the mean age of the 1,074 study participants was 79.7 years (range 65 to 100), and 27.3 percent were male. Using norms derived from the NEO-PI-R standardization sample (Costa and McCrae 1992), the mean T-score (SD) for each of the five personality traits was, on average, in the normal range, with the greatest departure from average observed for Openness.

Unadjusted (Raw) Correlations

As table 1 shows, sixteen of the eighty (20.0%) correlations between the "Big Five" personality traits and health care use were statistically significant, including six of the eighteen (33.3%) one-sided tests.

TABLE 1
Unadjusted (Raw) Correlations between the Big Five Personality Traits and Health Care Use

	Neuroticism	Extraversion	Openness to Experience	Agreeableness	Conscientiousness
ANY USE (N = 1,074)					
Any emergency department (ED) use					
• Rho	.102	−.040	.017	−.024	−.014
• p	.001**	.094	.570	.431	.658
Any hospital use					
• Rho	.052	−.006	.024	−.042	−.038
• p	.043*	.851	.430	.167	.214
Any rehabilitation hospital use (n = 333)[a]					
• Rho	.091	−.086	.036	−.041	−.108
• p	.049*	.118	.509	.453	.048*
Any skilled nursing facility (SNF) use					
• Rho	.052	−.016	−.010	−.046	−.051
• p	.043*	.609	.747	.133	.093
Any skilled home health care use					
• Rho	.002	−.024	.048	−.005	.002
• p	.472	.425	.119	.877	.944
Any custodial (nonskilled) nursing home use					
• Rho	.070	−.063	−.006	.001	−.105
• p	.012*	.039*	.846	.970	.001**
Any custodial (nonskilled) home care use					
• Rho	−.007	−.035	.104	.033	−.039
• p	.415	.248	.001**	.284	.198

Continued

TABLE 1—*Continued*

	Neuroticism	Extraversion	Openness to Experience	Agreeableness	Conscientiousness
AMOUNT OF USE AMONG THOSE WITH ANY USE					
Number of ED visits among those with at least one visit (n = 694)					
• r	.020	−.023	**−.088**	−.036	**−.083**
• p	.303	.272	**.020***	.350	**.028***
Number of hospital admissions among those with at least one admission (n = 668)					
• Rho	.004	−.056	−.035	−.066	−.002
• p	.454	.150	.364	.088	.958
Number of hospital days among those with at least one day (n = 668)					
• r	−.034	−.018	.047	**−.100**	−.005
• p	.190	.632	.227	**.010****	.890
Number of rehabilitation hospital admissions among those with at least one admission (n = 50)[a]					
• Rho	.154	−.262	−.057	−.182	−.168
• p	.143	.066	.693	.206	.244
Number of rehabilitation hospital days among those with at least one day (n = 50)[a]					
• r	.114	−.108	−.078	−.103	**−.355**
• p	.216	.456	.588	.476	**.011***

TABLE 1—*Continued*

	Neuroticism	Extraversion	Openness to Experience	Agreeableness	Conscientiousness
Number of SNF days among those with at least one day (n = 226)					
• r	.069	−.051	−.146	.018	−.084
• p	.150	.449	**.028***	.787	.210
Number of skilled home health care visits among those with at least one visit (n = 530)					
• r	−.011	.057	−.005	.053	.026
• p	.404	.189	.911	.222	.544
Number of custodial nursing home days among those with at least one day (n = 95)					
• r	.211	−.121	−.084	−.229	−.105
• p	**.020***	.242	.419	**.025***	.313
Number of custodial home care hours among those with at least one hour (n = 643)					
• r	−.002	.021	−.011	.054	−.010
• p	.476	.592	.777	.170	.807

Notes: * $p \leq .05$; ** $p \leq .01$.
One-tailed tests were used for Neuroticism for all seven services and for Extraversion for ED use. Two-tailed tests were used for all other hypotheses. Numbers in bold type indicate statistically significant correlations at $p \leq 0.05$.
[a]These data are for the West Virginia/Ohio site only and not the New York site. The West Virginia/Ohio site had a rehabilitation hospital, but the New York site did not. About 14.7 percent of the WV/OH patients were admitted to a rehabilitation hospital, compared with 0.7 percent of the New York site patients.

Individual Personality Traits in Regression Analyses

Any Use. Table 2 presents data on the use of services. Controlling for other variables, higher Neuroticism, as hypothesized, was associated with a greater probability of any ED use and with a greater likelihood of any custodial nursing home use. Furthermore, higher Openness to Experience was associated with a greater probability of any custodial home care use, higher Agreeableness with a greater likelihood of any custodial nursing home use, and higher Conscientiousness with a lower probability of any custodial nursing home use.

Amount of Use for Those with Use. As table 3 shows, controlling for other variables, there were associations of higher Neuroticism with more SNF days but with fewer hospital days. Higher Openness was associated with fewer ED visits and with fewer SNF days, and higher Conscientiousness with fewer ED visits.

Predicted Use for Personality Traits with Significant Associations. Table 4 compares the mean utilization predictions of being high in a personality trait (greater than one SD above the mean) with being low in that trait (below one SD lower than the mean). Persons high in Neuroticism had nearly a 25 percent higher mean predicted probability of any ED use. The predicted likelihood of any custodial nursing home use was more than double (112% higher) for persons high in Neuroticism, 27 percent higher for those high in Agreeableness, and about two-thirds (68%) lower for persons high in Conscientiousness. The predicted probability of any custodial home care use was 30 percent higher for patients high in Openness. Among users, persons high in Neuroticism had almost 25 percent more SNF days but 7 percent fewer hospital days; individuals high in Openness used about 16 percent fewer ED visits and 30 percent fewer SNF days; those high in Conscientiousness had 22 percent fewer ED visits.

Discussion

Our main finding was that the patient's personality was associated with several of the most expensive acute and long-term care services used by Medicare beneficiaries, controlling for predisposing, enabling, and need variables of the Andersen behavioral health care use framework. We observed associations of personality with utilization for services ranging

TABLE 2

Adjusted Associations between Personality Traits and Any Health Care Use, Including All Five Traits in Each Health Care Use Model

ANY USE (N = 1,074)	Any Emergency Department (ED)[a]		Any Hospital[a]		Any Rehab. Hospital (n = 333)[a,b]		Any Skilled Nursing Facility (SNF)[c]		Any Skilled Home Health Care[a]		Any Custodial Nursing Home[a]		Any Custodial Home Care[a]	
	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z
NEUROTICISM														
Controls for interventions, site, and study days	.029	3.37***	.007	0.85	.012	0.73	.003	0.72	.008	0.91	.023	1.62	−.001	−0.14
Adds predisposing, enabling, and need variables	.030	3.43***	.007	0.83	.007	0.41	.003	0.86	.006	0.68	.041	2.27*	−.006	−0.65
EXTRAVERSION														
Controls for interventions, site, and study days	−.003	−0.38	−.000	−0.04	−.006	−0.29	.003	0.92	−.008	−1.01	−.012	−0.79	−.015	−1.65
Adds predisposing, enabling, and need variables	−.006	−0.61	−.003	−0.27	−.009	−0.51	.007	1.89	−.005	−0.59	−.006	−0.31	−.001	−0.12
OPENNESS TO EXPERIENCE														
Controls for interventions, site, and study days	.003	0.39	.004	0.40	.021	0.94	−.002	−0.48	.016	1.99*	.004	0.33	.032	3.61***
Adds predisposing, enabling, and need variables	.001	0.73	.009	0.94	.004	0.15	−.002	−0.65	.013	1.35	.006	0.33	.020	2.33*

TABLE 2—Continued

ANY USE (N = 1,074)	Any Emergency Department (ED)[a]		Any Hospital[a]		Any Rehab. Hospital (n = 333)[a,b]		Any Skilled Nursing Facility (SNF)[c]		Any Skilled Home Health Care[a]		Any Custodial Nursing Home[a]		Any Custodial Home Care[a]	
	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z
AGREEABLENESS														
Controls for interventions, site, and study days	.004	0.45	−.007	−0.94	.004	0.24	−.002	−0.70	−.001	−0.15	.022	1.72	.012	1.33
Adds predisposing, enabling, and need variables	.001	0.15	−.004	−0.50	−.002	−0.11	−.006	−1.52	−.008	−0.93	.034	2.10*	−.008	−0.75
CONSCIENTIOUSNESS														
Controls for interventions, site, and study days	.004	0.52	−.005	−0.53	−.047	−1.76	−.006	−1.75	.005	0.59	−.044	−2.91**	−.013	−1.47
Adds predisposing, enabling, and need variables	.006	0.69	−.004	−0.44	−.053	−1.78	−.006	−1.87	.007	0.68	−.051	−3.06**	−.011	−1.22

Notes: $*p \leq .05$; $**p \leq .01$; $***p \leq .001$.
One-tailed tests were used for Neuroticism for all seven services and for Extraversion for ED use. Two-tailed tests were used for all other hypotheses. Numbers in bold type indicate statistically significant associations at $p \leq 0.05$.
[a]Logistic regression.
[b]These data are for the West Virginia/Ohio site only and not the New York site. The West Virginia/Ohio site had a rehabilitation hospital, but the New York site did not. About 14.7 percent of the WV/OH patients were admitted to a rehabilitation hospital, compared with 0.7 percent of the New York site patients.
[c]Heteroscedastic probit regression. The second equation includes two variables, for site and definite cognitive impairment.

TABLE 3
Adjusted Associations between Personality Traits and Amount of Health Care Use by Those Using Each Service, Including All Five Traits in Each Model

Amount of Use among Users of Each Service	ED Visits (n = 694)[a]		Hospital Admissions (n = 668)[b]		Hospital Days (n = 668)[c]		SNF Days (n = 226)[d]		Skilled Home Health Care Visits (n = 530)[d]		Custodial Nursing Home Days (n = 95)[e,f]		Custodial Home Care Hours (n = 643)[d]	
	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z
NEUROTICISM														
Controls for interventions, site, and study days	−.004	−0.75	−.004	−0.59	−.011	−1.90*	.014	1.92*	.005	0.48			.009	0.65
Adds predisposing, enabling, and need variables	−.003	−0.58	−.006	−0.73	−.009	−1.71*	.022	2.81**	−.002	−0.31			−.002	−0.33
EXTRAVERSION														
Controls for interventions, site, and study days	.004	0.52	−.007	−1.07	−.002	−0.39	.006	0.78	.006	0.74			.003	0.32
Adds predisposing, enabling, and need variables	.000	0.05	−.009	−1.35	−.000	−0.00	.007	1.15	.006	0.91			.004	0.54
OPENNESS TO EXPERIENCE														
Controls for interventions, site, and study days	−.020	−3.56***	−.006	−0.77	.007	1.14	−.021	−2.64*	−.007	−0.86			−.002	−0.15
Adds predisposing, enabling, and need variables	−.014	−2.32**	−.006	−0.92	−.003	−0.45	−.030	−3.47***	−.006	−0.92			.000	0.04

Continued

TABLE 3—*Continued*

Amount of Use among Users of Each Service	ED Visits (n = 694)[a]		Hospital Admissions (n = 668)[b]		Hospital Days (n = 668)[c]		SNF Days (n = 226)[d]		Skilled Home Health Care Visits (n = 530)[d]		Custodial Nursing Home Days (n = 95)[e,f]		Custodial Home Care Hours (n = 643)[d]	
	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z	Coef	z
AGREEABLENESS														
Controls for interventions, site, and study days	−.005	−.78	−.006	−.88	−.014	−2.39*	.011	1.70	.008	1.06			.011	0.96
Adds predisposing, enabling, and need variables	−.004	−.63	−.005	−.69	−.006	−1.16	.005	0.84	.003	0.47			.006	0.88
CONSCIENTIOUSNESS														
Controls for interventions, site, and study days	−.014	−2.12*	−.002	−.22	−.005	−.86	−.009	−1.17	.010	1.18			.24	1.71
Adds predisposing, enabling, and need variables	−.013	−2.06*	−.006	−.78	−.007	−1.12	−.004	−.59	.003	0.47			.71	3.38

Notes: *$p \leq .05$; **$p \leq .01$, ***$p \leq .001$.

One-tailed tests were used for Neuroticism for all seven services and for Extraversion for ED use. Two-tailed tests were used for all other hypotheses. Numbers in bold type indicate statistically significant associations at $p \leq .05$.

[a]Zero-truncated negative binomial regression with mean dispersion.

[b]Zero-truncated negative binomial regression with constant dispersion.

[c]Generalized Linear Model—inverse Gaussian distribution with a log link.

[d]Generalized Linear Model—gamma distribution with a log link.

[e]Maximum likelihood four-equation mixture model. Equation 1 uses an exponential distribution; equation 2 employs a gamma distribution; equation 3 has a constant for the variance; and equation 4 is a probability model that assigns each observation to equations 1 and 2.

[f]Chi square statistic = 76.63***. This statistic is a joint test for ten personality traits: the five traits in equation 1 and the five traits in equation 2. Equation 4 does not include any personality traits. The five personality traits in equation 1 are significant at $p < .001$ (Chi square statistic = 60.78). The five personality traits in equation 2 are significant at $p = .014$ (Chi square statistic = 14.36).

TABLE 4
Predicted Mean Health Care Use for Health Care Services with Significant Personality Associations

	Predicted Mean Health Care Use for Personality Trait Score			Difference in Mean Use for Individuals above Plus One SD Compared with Those below Minus One SD	
	Below Minus One SD (95% CI)	Between One SD below and One SD above the Mean	Above Plus One SD (95% CI)	Absolute Difference	Relative Difference
ANY USE					
NEUROTICISM					
● Any emergency department (ED) use	.581 (.565–.598)	.647	.723 (.710–.737)	+.142	+24.4%
● Any custodial nursing home use	.057 (.044–.069)	.090	.121 (.101–.140)	+.064	+112.3%
OPENNESS TO EXPERIENCE					
● Any custodial home care use	.518 (.490–.547)	.600	.676 (.652–.700)	+.158	+30.5%
AGREEABLENESS					
● Any custodial nursing home use	.085 (.067–.104)	.086	.108 (.084–.132)	+.023	+27.0%
CONSCIENTIOUSNESS					
● Any custodial nursing home use	.148 (.124–.173)	.084	.047 (.034–.059)	−.101	−68.2%

Continued

TABLE 4—Continued

	Predicted Mean Health Care Use for Personality Trait Score			Difference in Mean Use for Individuals above Plus One SD Compared with Those below Minus One SD	
	Below Minus One SD (95% CI)	Between One SD below and One SD above the Mean	Above Plus One SD (95% CI)	Absolute Difference	Relative Difference
AMOUNT OF USE AMONG USERS OF EACH SERVICE					
NEUROTICISM					
• Predicted mean number of skilled nursing facility (SNF) days among those with any SNF use (n = 226)	40.8 (35.7–45.8)	44.8	50.5 (44.1–57.0)	+9.7	+23.8%
• Predicted mean number of nonrehabilitation hospital days among those with any nonrehabilitation hospital use (n = 668)	18.3 (17.0–19.6)	17.4	17.1 (15.7–18.4)	−1.2	−6.6%
OPENNESS TO EXPERIENCE					
• Predicted mean number of ED visits among those with any ED use (n = 694)	2.91 (2.80–3.03)	2.56	2.45 (2.36–2.53)	−0.46	−15.8%
• Predicted mean number of SNF days among those with any SNF use (n = 226)	56.2 (50.0–62.5)	43.6	39.3 (34.3–44.4)	−16.9	−30.1%
CONSCIENTIOUSNESS					
• Predicted mean number of ED visits among those with any ED visits (n = 694)	2.92 (2.78–3.07)	2.59	2.29 (2.17–2.41)	−0.63	−21.6%

Note: These predictions were generated from the logistic and GLM models that were statistically significant in tables 2 and 3. The mean in each cell was calculated using the final set of variables in tables 2 and 3, that is, the full model including the predisposing, enabling, and need variables.

from arguably the least discretionary (emergency department and hospital use) to services intermediate in discretion (SNF and skilled home health care use) to those that many would consider the most discretionary (custodial nursing home use and custodial home care use). The magnitudes of these observed associations are far from trivial. For those personality traits with significant associations, predicted use generally ranged from 16 to 30 percent greater for people high (low) compared with persons low (high) in specific personality traits. The largest difference we found was for probability of custodial nursing home use, which was three times higher for persons low versus high in Conscientiousness.

Our hypothesis that higher Neuroticism would be associated with greater health care use was confirmed for three services (emergency department use, custodial nursing home use, and SNF days) but was disconfirmed for one (hospital days). Higher Neuroticism was associated with poor impulse-control (De Jong, van Sonderen, and Emmelkamp 1999), somatic sensitivity (Costa and McCrae 1987), health worry (Friedman 2000), and poorer medication adherence (Jerant et al. 2011), all of which would increase the likelihood of ED use and perhaps custodial nursing home use. More SNF days among people with higher Neuroticism could be the result of these patients being less likely to correctly and fully carry out their rehabilitation regimens, just as they are less likely to adhere to medications (Jerant et al. 2011). Research is needed to understand why Neuroticism influences utilization in apparently discrepant ways.

Although we had previously found that higher Extraversion was associated with a greater probability of emergency department use in a sample of primary care patients (Chapman et al. 2009), our results from the demonstration sample did not provide evidence of an association. This may have been because our study sample had a much greater proportion of subjects with any ED use and in the earlier study they were older, less educated, and more disabled.

Greater Openness to Experience was associated with a greater probability of any custodial home care use, fewer ED visits among those with ED use, and fewer SNF days conditional on SNF use. Individuals higher in Openness may be more receptive to being cared for at home (i.e., receiving custodial home care) than in a nursing home. Such persons are more receptive to following self-management protocols and using preventive services and health check-ups (Iwasa et al. 2009), all of which might obviate the need for ED visits. When in an SNF, individuals high in Openness may avail themselves of more postacute and rehabilitation therapies, resulting in a shorter SNF stay.

Higher Agreeableness was associated with a greater likelihood of any custodial nursing home use. Individuals who are high in this trait are more acquiescent and trusting. They may be more willing to trust the judgments and recommendations of clinicians, family members, or friends. These individuals may also be less willing to burden others in their family or social network (Riffin et al. 2012).

Higher Conscientiousness was associated with a lower probability of any custodial nursing home use and with fewer ED visits by those with any ED use. Conscientiousness is related to the evaluation of health risks (Hampson et al. 2000), treatment adherence, and engagement in health promotion as well as disease prevention activities (Bogg and Roberts 2004; Roberts, Walton, and Bogg 2005), all of which could lead to better health and less likelihood of custodial nursing home admission. Conscientious individuals have better impulse control and lower rates of major accidents as well as generally good health behaviors (Bogg and Roberts 2004; Roberts, Walton, and Bogg 2005), which in turn would decrease the number of ED visits.

Limitations

A potential limitation is that we included no supply-side (physician, practice, and market) variables in our analysis. However, in a recent, nationally representative, study of high-cost Medicare beneficiaries with a very comprehensive set of supply- and demand-side variables, only two supply-side variables consistent with previous research had significant associations with health care expenditures. Furthermore, a large majority of costs were due to demand-side variables, and the predominant predictor was health (Reschovsky et al. 2011). Second, health care expenditures are the product of the quantity of service use multiplied by the price per unit. By excluding the effect of price, we were able to focus on quantity alone. Given our findings, research on personality and expenditures is warranted. Third, questions could be raised about the need to control type I errors. Some researchers would use an approach such as a Bonferroni correction or simply reduce the *p* value from the customary value of .05 to .01 or another value. However, in a study like ours that is examining an issue for the first time, we believe that it is better to use the conventional value of .05. It is better suited to hypothesis generation. Moreover, the Bonferroni correction is too conservative (Rothman 1990; Streiner and Norman 2011), and its use here could discourage future researchers from examining some of the

implications of personality for health service utilization. Fourth, the internal consistency reliability (Cronbach's alpha) for the Extraversion (.62) and Openness to Experience (.54) scales each are below the generally accepted criterion of .70 or higher. But it is unlikely that this would affect our study conclusions because the associations of these two traits with health care use are so low. For example, correlations would be expected to increase by a factor of only approximately 1.14 for Openness (owing to an increase in reliability from 0.54 to 0.70), and by only about 1.06 for Extraversion (Nunnally and Bernstein 1994). The only exception is Extraversion's association with any SNF use (currently $z = 1.89$), which may reach statistical significance with a higher alpha. The relatively low alpha for Extraversion could be explained by the high levels of functional impairment and depression in our sample. Extraversion taps activity and positive affect as well as positive emotions and sociability. Like Extraversion, Openness is a very heterogeneous construct. Moreover, the low education level of our sample might account for the lower alpha for Openness. Fifth, because the study included only Medicare beneficiaries aged sixty-five and older, our findings may not generalize to other populations. Sixth, it is possible that some people did not complete their health care usage forms when they were expected to do so. But even if they completed their journals only once every two months, this is unlikely to have biased the observed associations with personality. Moreover, the patient/caregiver would only have to recall health care use related to a rare event (e.g., a serious acute illness) that occurred, at most, two months in the past. Finally, some variables in the Andersen model are themselves related to personality traits, for example, cognitive status (Duberstein et al. 2011). Thus, the independent associations of personality with utilization may have been underestimated.

Implications for Policy, Practice, and Research

Only recently have policy implications of personality been considered (Borghans et al. 2008; Chapman, Hampson, and Clarkin in press; Chapman, Roberts, and Duberstein 2011). With respect to health policy, arguments have been made for considering the implications of patient personality for the design of health services (Chapman, Roberts, and Duberstein 2011), particularly given the recent attention to patient-centered care (Epstein et al. 2005; Mead and Bower 2000) and the patient-centered medical home (American Academy of Family Physicians et al. 2007).

The current findings are the first to point to the need to consider the implications of patient personality for Medicare. The routine inclusion of a reliable, valid personality inventory as part of the "Welcome to Medicare" physical exam for which individuals become eligible upon enrollment in Medicare Part B would have two uses. First, physician group practices, hospitals, nursing homes, home care agencies, health care systems, health insurers, and even local communities could develop estimates and forecasts of the overuse and underuse of health care services by personality trait. This would give them a better understanding of how groups of patients have used various important services and how they might use them in the future. They could then develop population-based interventions to address, for instance, longer SNF stays by patients high in Neuroticism.

Second, Medicare could designate specific personality instruments to be periodically administered to patients in primary care waiting rooms. The collected information would then be included in the patients' electronic medical record. In concert with decision aids and algorithms, this information would be expected to improve the delivery of patient-centered care (Chapman, Roberts, and Duberstein 2011) by more precisely targeting risk populations (Cuijpers et al. 2010) and customizing health-messaging campaigns (Noar, Benac, and Harris 2007) as well as interventions (Davidson et al. 2007). A study of an intervention designed to be responsive to individuals with particular psychological characteristics, whose purpose was to reduce coronary heart disease risk, shortened hospital length of stay and lowered average hospital costs, resulting in overall cost savings (Davidson et al. 2007).

Third, our findings indicate the potential importance of including personality measures in the risk adjustment of payments by Medicare to health plans and providers. Risk adjustment will become even more important as its use is expanded to new types of organizations that are key to health care cost control in the Patient Protection and Affordable Care Act of 2010. Innovative payment and service delivery models such as Accountable Care Organizations and medical homes are already being tested and are considered to have considerable promise to bend the health care cost curve (Song et al. 2012). If successful, these models will be used by not only Medicare but also Medicaid and third-party payers in general.

Recent improved Medicare risk-adjustment payment models have increased the proportion of explained reimbursement variation by

incorporating such approaches as adding an improved comorbidity measure for Medicare Advantage plans (Frogner et al. 2011) and by including many more hierarchical condition categories for bundled primary care payments (Ash and Ellis 2012). Although considerably higher in the newest research on primary care spending (Ash and Ellis 2012), the proportion of variance explained remains relatively low for most categories of health care spending and utilization (Ash and Ellis 2012; Frogner et al. 2011; Kautter et al. 2012), leaving room for improvement by the potential inclusion of personality traits.

Our findings suggest that personality ought to be considered a predisposing factor in Andersen's behavioral model. Nearly thirty years after introducing the model, Andersen (1995, 2) himself suggested that "psychological characteristics" could be considered as "another possible predisposing component." Although he did not mention personality, the inclusion of personality traits in Andersen's behavioral model and other models (e.g., Barker et al. 1990; Pescosolido, Gardner, and Lubell 1998) is clearly merited. High-priority questions concern the role of personality in health care expenditures, risk adjustment, and the underuse of effective nondiscretionary health care services. The evidence for underuse applies to both U.S. patients in general, who receive only about half the recommended processes for basic care (McGlynn et al. 2003), and to Medicare beneficiaries in particular, by whom there is a vast underuse of appropriate and effective acute, chronic, and preventive care (Asch et al. 2000; Leatherman and McCarthy 2005). While underuse is likely in part a supply-side issue, for example, with providers not having enough time for preventive services, owing to competing acute and chronic care needs (Jaen, Stange, and Nutting 1994), it is almost certainly a demand-side issue as well. To enhance the use of preventive services, researchers have recently documented the effectiveness of messaging interventions inspired by behavioral economics principles (Milkman et al. 2011). Although a broad-strokes approach works well on a population level, follow-up initiatives that target stragglers could customize the message to patients' personality characteristics to enhance self-relevance.

Finally, although the individual was the unit of analysis in our study, the implications for state and other geographic levels should not be ignored. Martin and colleagues (2007) reported that Utah was lowest in per capita health care spending, and it is interesting that Utah also was ranked lowest in Neuroticism (as well as fourth highest in Agreeableness,

fourth highest in Conscientiousness, and eighth highest in Extraversion) (Rentfrow, Gosling, and Potter 2008). The role that personality traits play in health care use and spending across states and hospital referral regions thus should be examined.

Conclusion

Our study established that personality traits—in particular, Openness to Experience, Conscientiousness, Agreeableness, and Neuroticism— are associated with several expensive acute and long-term care services used by older adults. A premise of personalized medicine is that patients will have better outcomes if their care is matched to their unique characteristics (Hamburg and Collins 2010). The literature on personalized medicine has focused exclusively on demographic and biomedical characteristics (Chapman, Roberts, and Duberstein 2011), and the word *personality* does not appear in several key publications on patient-centered care and the patient-centered medical home (e.g., American Academy of Family Physicians et al. 2007; Davis, Schoenbaum, and Audet 2005; Patient-Centered Primary Care Collaborative 2008; Rosenthal 2008). Given its history, the failure of personality science to meaningfully inform public health or policy is not surprising. Yet reviews of patient-centeredness note the potential importance of provider and patient personality (Epstein et al. 2005; Mead and Bower 2000), and there have been profound advances in personality psychology over the past few decades. If person-centered interventions and innovations in health care delivery make use of these advances, they may be able to help contain the continuing rise in health care use and costs.

References

Aaron, H.J., and P.B. Ginsburg. 2009. Is Health Spending Excessive? If So, What Can We Do about It? *Health Affairs* 28(5):1260–75.

American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, and American Osteopathic Association. 2007. *Joint Principles of the Patient-Centered Medical Home*. Available at http://www.aap.org/en-us/professional-resources/practice-support/quality-improvement/Documents/Joint-Principles-Patient-Centered-Medical-Home.pdf (accessed May 17, 2012).

Andersen, R.M. 1968. *A Behavioral Model of Families' Use of Health Services*. Research Series no. 25. Chicago: Center for Health Administration Studies, University of Chicago.

Andersen, R.M. 1995. Revisiting the Behavioral Model and Access to Medical Care: Does It Matter? *Journal of Health and Social Behavior* 36(1):1–10.

Andersen, R.M., and J.F. Newman. 1973. Societal and Individual Determinants of Medical Care Utilization in the United States. *The Milbank Memorial Fund Quarterly: Health & Society* 51(1):95–124. Available at http://www.milbank.org/about-the-fund/history/the-milbank-quarterly-centennial-edition (accessed June 21, 2013).

Asch, S.M., E.M. Sloss, C. Hogan, R.H. Brook, and R.L. Kravitz. 2000. Measuring Underuse of Necessary Care among Elderly Medicare Beneficiaries Using Inpatient and Outpatient Claims. *JAMA* 284(18):2325–33.

Ash, A.S., and R.P. Ellis. 2012. Risk-Adjusted Payment and Performance Assessment for Primary Care. *Medical Care* 50(8):643–53.

Barker, C., N. Pistrang, D.A. Shapiro, and I. Shaw. 1990. Coping and Help-Seeking in the UK Adult Population. *British Journal of Clinical Psychology* 29(pt. 3):271–85.

Bogg, T., and B.W. Roberts. 2004. Conscientiousness and Health-Related Behaviors: A Meta-Analysis of the Leading Behavioral Contributors to Mortality. *Psychological Bulletin* 130(6):887–919.

Borghans, L., A.L. Duckworth, J.J. Heckman, and B. ter Weel. 2008. The Economics and Psychology of Personality Traits. *Journal of Human Resources* 43(4):972–1059.

Chapman, B.P., K. Fiscella, I. Kawachi, and P.R. Duberstein. 2010. Socioeconomic Status, Personality, and All Cause Mortality in the United States. *American Journal of Epidemiology* 171(1):83–92.

Chapman, B.P., S.H. Hampson, and J. Clarkin. In Press. Personality-Based Interventions for Healthy Aging: Results from a National Institute on Aging Workgroup. *Developmental Psychology.*

Chapman, B.P., J.M. Lyness, and P. Duberstein. 2007. Personality and Medical Illness Burden among Older Adults in Primary Care. *Psychosomatic Medicine* 69(3):277–82.

Chapman, B.P., B. Roberts, and P. Duberstein. 2011. Personality and Longevity: Knowns, Unknowns, and Implications for Public Health and Personalized Medicine. *Journal of Aging Research*, Epub July 10.

Chapman, B.P., M. Shah, B. Friedman, R. Drayer, P.R. Duberstein, and J.M. Lyness. 2009. Personality Traits Predict Emergency Department Utilization over Four Years in Older Adults. *American Journal of Geriatric Psychiatry* 17(6):526–35.

CMS (Centers for Medicare and Medicaid Services). 1998. *Health of Seniors Survey Instructions*. Available at www.cms.hhs.gov/surveys/hos/download/HOS_1998_Survey.pdf (accessed January 14, 2004).

Costa, P.T., Jr., and R.R. McCrae. 1980. Influence of Extraversion and Neuroticism on Subjective Well-Being: Happy and Unhappy People. *Journal of Personality and Social Psychology* 38(4):668–78.

Costa, P.T., Jr., and R.R. McCrae. 1987. Neuroticism, Somatic Complaints and Disease: Is the Bark Worse Than the Bite? *Journal of Personality* 55(2):299–316.

Costa, P.T., Jr., and R.R. McCrae. 1992. *Revised NEO Personality Inventory and NEO Five Factor Inventory: Professional Manual*. Odessa, FL: Psychological Assessment Resources.

Cuijpers, P., F. Smit, B.W.J.H. Penninx, R. de Graaf, M. ten Have, and A.T.F. Beekman. 2010. Economic Costs of Neuroticism: A Population-Based Study. *Archives of General Psychiatry* 67(10): 1086–93.

Davidson, K.W., Y. Gidron, E. Mostofsky, and K.J. Trudeau. 2007. Hospitalization Cost Offset of a Hostility Intervention for Coronary Heart Disease Patients. *Journal of Consulting and Clinical Psychology* 75(4):657–62.

Davis, K., S.C. Schoenbaum, and A-M. Audet. 2005. A 2020 Vision of Patient-Centered Primary Care. *Journal of General Internal Medicine* 20(10):953–57.

De Jong, G.M., E. van Sonderen, and P.M.G. Emmelkamp. 1999. A Comprehensive Model of Stress—The Roles of Experienced Stress and Neuroticism in Explaining the Stress-Distress Relationship. *Psychotherapy and Psychosomatics* 68(6):290–98.

Duberstein, P.R., B.P. Chapman, R.M. Epstein, K.R. McCollumn, and R. Kravitz. 2008. Physician Personality Characteristics and the Detection of Depression in Primary Care. *Journal of General Internal Medicine* 23(11):1791–95.

Duberstein, P.R., B.P. Chapman, H.A. Tindle, K.M. Sink, P. Bamonti, J. Robbins, A.F. Jerant, and P. Franks. 2011. Personality and Risk for Alzheimer's Disease in Adults 72 Years of Age and Older: A 6-Year Follow-Up. *Psychology and Aging* 26(2):351–62.

Duberstein, P.R., S. Sorensen, J.M. Lyness, D.A. King, Y. Conwell, L. Seidlitz, and E.D. Caine. 2003. Personality Is Associated with Perceived Health and Functional Status in Older Primary Care Patients. *Psychology and Aging* 18(1):25–37.

Epstein, R.M., P. Franks, K. Fiscella, C.G. Shields, S.C. Meldrum, R.L. Kravitz, and P.R. Duberstein. 2005. The Goal of Patient-Centered Communication: Theoretical and Practical Issues. *Social Science & Medicine* 61(7):1516–28.

Epstein, S. 1979. The Stability of Behavior: I. On Predicting Most of the People Much of the Time. *Journal of Personality and Social Psychology* 37(7):1097–1126.

Farrell, D., E. Jensen, B. Kocher, N. Lovegrove, F. Melhem, L. Mendonca, and B. Parish. 2008. *Accounting for the Cost of US Health Care: A New Look at Why Americans Spend More.* McKinsey Global Institute. Available at http://www.mckinsey.com/Insights/MGI/Research/Americas/Accounting_for_the_cost_of_US_health_care (accessed April 11, 2012).

Flynn, K.E., and M.A. Smith. 2007. Personality and Healthcare Decision-Making Style. *Journal of Gerontology: Psychological Sciences* 62B(5):P261–67.

Friedman, B., B.R. Wamsley, D.V. Liebel, Z.B. Saad, and G.M. Eggert. 2009. Patient Satisfaction, Empowerment, and Health and Disability Status Effects of a Disease Management–Health Promotion Nurse Intervention among Medicare Beneficiaries with Disabilities. *The Gerontologist* 49(6):778–92.

Friedman, H.S. 2000. Long-Term Relations of Personality and Health: Dynamisms, Mechanisms, Tropisms. *Journal of Personality* 68(6):1089–1107.

Frogner, B.K., G.F. Anderson, R.A. Cohen, and C. Abrams. 2011. Incorporating New Research into Medicare Risk Adjustment. *Medical Care* 49(3):295–300.

Ginsburg, P.B. 2008. *High and Rising Health Care Costs: Demystifying U.S. Health Care Spending.* Research Synthesis Report no. 16. Princeton, NJ: Robert Wood Johnson Foundation. Available at http://www.rwjf.org/en/research-publications/find-rwjf-research/2008/10/high-and-rising-health-care-costs.html (accessed April 11, 2012).

Goldberg, L.R. 1993. The Structure of Phenotypic Personality Traits. *American Psychologist* 48(1):26–34.

Goodwin, R.D., C.W. Hoven, J.S. Lyons, and M.B. Stein. 2002. Mental Health Service Utilization in the United States: The Role of Personality Factors. *Social Psychiatry and Psychiatric Epidemiology* 37: 561–66.

Hamburg, M.A., and F.S. Collins. 2010. The Path to Personalized Medicine. *New England Journal of Medicine* 363(4):301–4.

Hampson, S.E., J.A. Andrews, M. Barckley, E. Lichtenstein, and M.E. Lee. 2000. Conscientiousness, Perceived Risk, and Risk-Reduction Behaviors: A Preliminary Study. *Health Psychology* 19(5):496–500.

Hartman, M., A.B. Martin, J. Benson, A. Catlin, and the National Health Expenditure Accounts Team. 2013. National Health Spending in 2011: Overall Growth Remains Low, but Some Payers and Services Show Signs of Acceleration. *Health Affairs* 32(1):87–99.

Honda, K., and J.S. Jacobson. 2005. Use of Complementary and Alternative Medicine among United States Adults: The Influences of Personality, Coping Strategies, and Social Support. *Preventive Medicine* 40(1):46–53.

Hopwood, C.J., B.D. Quigley, C.M. Grilo, C.A. Sanislow, T.H. McGlashan, S. Yen, M.T. Shea, M.C. Zanarini, J.G. Gunderson, A.E. Skodol, J.C. Markowitz, and L.C. Morey. 2008. Personality Traits and Mental Health Treatment Utilization. *Personality and Mental Health* 2:207–17.

Issikatis, C., and G. Andrews. 2002. Service Utilization for Anxiety in an Australian Community Sample. *Social Psychiatry and Psychiatric Epidemiology* 37(4):153–63.

Iwasa, H., Y. Masui, Y. Gondo, Y. Yoshida, H. Inagaki, C. Kawaai, H. Kim, H. Yoshida, and T. Suzuki. 2009. Personality and Participation in Mass Health Checkups among Japanese Community-Dwelling Elderly. *Journal of Psychosomatic Research* 66(2):155–59.

Jackson, J.J., P.L. Hill, B.R. Payne, B.W. Roberts, and E.A. Stine-Morrow. 2012. Can an Old Dog Learn (and Want to Experience) New Tricks? Cognitive Training Increases Openness to Experience in Older Adults. *Psychology and Aging* 27(2):286–92.

Jaen, C.R., K.C. Stange, and P.A. Nutting. 1994. Competing Demands of Primary Care: A Model for the Delivery of Clinical Preventive Services. *Journal of Family Practice* 38(2):166–71.

Jerant, A., B. Chapman, P. Duberstein, J. Robbins, and P. Franks. 2011. Personality and Medication Non-Adherence among Older Adults Enrolled in a Six-Year Trial. *British Journal of Health Psychology* 16(pt. 1):151–69.

Kautter, J., M. Ingber, G.C. Pope, and S. Freeman. 2012. Improvements in Medicare Part D Risk Adjustment: Beneficiary Access and Payment Accuracy. *Medical Care* 50(12):1102–8.

Kempen, G.I.J.M., and T.P.B.M. Suurmeijer. 1991. Professional Home Care for the Elderly: An Application of the Andersen-Newman Model in the Netherlands. *Social Science & Medicine* 33(9):1081–89.

Landi, F., E. Tua, G. Onder, B. Carrara, A. Sgadari, C. Rinaldi, G. Gambassi, F. Lattanzio, and R. Bernabei for the SILVERNET-HC Study Group of Bergamo. 2000. Minimum Data Set for Home Care: A Valid Instrument to Assess Frail Older People Living in the Community. *Medical Care* 38(12):1184–90.

Leatherman, S., and D. McCarthy. 2005. *Quality of Health Care for Medicare Beneficiaries: A Chartbook, Focusing on the Elderly Living in the Community*. New York: Commonwealth Fund.

Lin, W.-C., R.L. Kane, D.R. Mehr, R.W. Madsen, and G.F. Petroski. 2006. Changes in the Use of Postacute Care during the Initial Medicare Payment Reforms. *Health Services Research* 41(4): 1338–56.

Marshall, G.N., C.B. Wortman, R.R. Vickers Jr., J.W. Kusulas, and L.K. Hervig. 1994. The Five-Factor Model of Personality as a Framework for Personality-Health Research. *Journal of Personality and Social Psychology* 67(2):278–86.

Martin, A.B., L. Whittle, S. Heffler, M.C. Barron, A. Sisko and B. Washington. 2007. Health Spending by State of Residence, 1991–2004. *Health Affairs* 26(6):w651–w663.

McAdams, D.P., and J.L. Pals. 2006. A New Big Five: Fundamental Principles for an Integrative Science of Personality. *American Psychologist* 61(3):204–17.

McCrae, R., and P. Costa. 1997. Personality Trait Structures as a Human Universal. *American Psychologist* 52(5):509–16.

McGlynn, E.A., S.M. Asch, J. Adams, J. Keesey, J. Hicks, A. DeCristofaro, and E.A. Kerr. 2003. The Quality of Health Care Delivered to Adults in the United States. *New England Journal of Medicine* 348(26):2635–45.

Mead, M., and P. Bower. 2000. Patient-Centredness: A Patient Framework and Review of the Empirical Literature. *Social Science & Medicine* 51(7):1087–1110.

Milkman, K.L., J. Beshears, J.J. Choi, D. Laibson, and B.C. Madrian. 2011. Following Through on Good Intentions: The Power of Planning Prompts. Working Paper 17995. Cambridge, MA: National Bureau of Economics Research. Available at http://www.nber.org/papers/w17995 (Accessed May 7, 2012).

Mischel, W. 1968. *Personality and Assessment*. New York: Wiley.

Morris, J.N., B.E. Fries, D.R. Mehr, C. Hawes, C. Phillips, V. Mor, and L.A. Lipsitz. 1994. MDS Cognitive Performance Scale. *Journal of Gerontology: Medical Sciences* 49A(4):M174–82.

Nettle, D. 2005. An Evolutionary Approach to the Extraversion Continuum. *Evolution and Human Behavior* 26(4):363–73.

Noar, S.M., C.N. Benac, and M.S. Harris. 2007. Does Tailoring Matter? Meta-Analytic Review of Tailored Print Health Behavior Change Interventions. *Psychological Bulletin* 133(4):673–93.

Nunnally, J.C., and I.H. Bernstein. 1994. *Psychometric Theory*. 3rd ed. New York: McGraw-Hill.

OECD (Organization for Economic Cooperation and Development). 2011. *Health: Spending Continues to Outpace Economic Growth in Most OECD Countries*. Available at http://www.oecd.org/document/38/0,3746,en_21571361_44315115_48289894_1_1_1_1,00.html (accessed April 11, 2012).

Parboosingh, E.J., and D.E. Larsen. 1987. Factors Influencing Frequency and Appropriateness of Utilization of the Emergency Room by the Elderly. *Medical Care* 25(12):1139–47.

Parslow, R.A., and A.F. Jorm. 2000. Who Uses Mental Health Services in Australia? An Analysis of Data from the National Survey of

Mental Health and Wellbeing. *Australian and New Zealand Journal of Psychiatry* 34(6):997–1008.

Patient-Centered Primary Care Collaborative. 2008. *Patient-Centered Medical Home: Building Evidence and Momentum—A Compilation of PCMH Pilot and Demonstration Projects.* Washington, DC.

Pescosolido, B.A., C.B. Gardner, and K.M. Lubell. 1998. How People Get into Mental Health Services: Stories of Choice, Coercion and "Muddling Through" from "First-Timers." *Social Science & Medicine* 46(2):275–86.

Rentfrow, P.J., S.D. Gosling, and J. Potter. 2008. A Theory of the Emergence, Persistence, and Expression of Regional Variation in Basic Traits. *Perspectives on Psychological Science* 3(5):339–69.

Reschovsky, J.D., J. Hadley, C.B. Saiontz-Martinez, and E.R. Boukus. 2011. Following the Money: Factors Associated with the Cost of Treating High-Cost Medicare Beneficiaries. *Health Services Research* 46(4):997–1021.

Riffin, C., C.E. Löckenhoff, K. Pillemer, B. Friedman, and P.T. Costa Jr. 2012. Care Recipient Agreeableness Is Associated with Caregiver Subjective Physical Health Status. *Journal of Gerontology: Psychological Sciences* (Epub ahead of print).

Roberts, B.W., K.E. Walton, and T.B. Bogg. 2005. Conscientiousness and Health across the Life Course. *Review of General Psychology* 9(2):156–68.

Roberts, B.W., K.E. Walton, and W. Viechtbauer. 2006. Patterns of Mean-Level Change in Personality Traits across the Life Course: A Meta-Analysis of Longitudinal Studies. *Psychological Bulletin* 132(1):1–25.

Rosenthal, T.C. 2008. The Medical Home: Growing Evidence to Support a New Approach to Primary Care. *Journal of the American Board of Family Medicine* 21(5):427–40.

Rothman, K.J. 1990. No Adjustments Are Needed for Multiple Comparisons. *Epidemiology* 1(1):43–46.

Saklofske, D.H., E.J. Austin, B.A. Rohr, and J.J.W. Andrews. 2007. Personality, Emotional Intelligence, and Exercise. *Journal of Health Psychology* 12(6):937–48.

Shaughnessy, P.W., K.S. Crisler, and R.R. Schlenker. 1997. *Medicare's OASIS: Standardization Outcome and Assessment Information Set for Home Health Care: OASIS B.* Denver: Center for Health Services and Policy Research.

Song, Z., D.G. Safran, B.E. Landon, M.B. Landrum, Y. He, R.E. Mechanic, M.P. Day, and M.E. Chernew. 2012. The "Alternative Quality Contract," Based on a Global Budget, Lowered Medical Spending and Improved Quality. *Health Affairs* 31(8):1885–94.

Specht, J., B. Egloff, and S.C. Schmukle. 2011. Stability and Change of Personality across the Life Course: The Impact of Age and Major

Life Events on Mean-Level and Rank-Order Stability of the Big Five. *Journal of Personality and Social Psychology* 101(4):862–82.

Squires, D.A. 2011. *The U.S. Health System in Perspective: A Comparison of Twelve Industrialized Nations*. New York: Commonwealth Fund. Available at http://www.commonwealthfund.org/~/media/Files/Publications/Issue%20Brief/2011/Jul/1532_Squires_US_hlt_sys_comparison_12_nations_intl_brief_v2.pdf (accessed April 11, 2012).

Streiner, D.L., and G.R. Norman. 2011. Correction for Multiple Testing: Is There a Resolution? *Chest* 140(1):16–18.

Tansey, M.J. 1992. Countertransference Theory, Quantitative Research, and the Problem of Therapist-Patient Sexual Abuse. In *Interface of Psychoanalysis and Psychology*, ed. J.W. Barron, M.N. Eagle, and D.L. Wolitzky, 539–57. Washington, DC: American Psychological Association.

ten Have, M., J. Iedema, J. Ormel, and W. Vollebergh. 2006. Explaining Service Use for Mental Health Problems in the Dutch General Population: The Role of Resources, Emotional Disorder and Functional Impairment. *Social Psychiatry and Psychiatric Epidemiology* 41(4):285–93.

ten Have, M., A. Oldehinkel, W. Vollegergh, and J. Ormel. 2005. Does Neuroticism Explain Variations in Care Service Use for Mental Health Problems in the General Population? Results from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Social Psychiatry and Psychiatric Epidemiology* 40(6):425–31.

van Hemert, A.M., C.H. Bakker, J.P. Vandenbroucke, and H.A. Valkenburg. 1993. Psychologic Distress as a Longterm Predictor of Medical Utilization. *International Journal of Psychiatry in Medicine* 23(3):295–305.

von Dras, D.D., and I.C. Siegler. 1997. Stability in Extraversion and Aspects of Social Support at Midlife. *Journal of Personality and Social Psychology* 72(1):233–41.

Weiss, A., P.T. Costa Jr., J. Karuza, P.R. Duberstein, B. Friedman, and R.R. McCrae. 2005. Cross-Sectional Age Differences in Personality among Medicare Patients Aged 65 to 100. *Psychology and Aging* 20(1):182–85.

APPENDIX 1

Independent Variables by Category

Category	Independent Variables	Definition
• Demonstration controlling covariates[a]	• Medicare PCDC demonstration interventions	• Home visiting nurse, consumer-directed voucher, and their combination; reference category = control
	• Study site	• 1 = WV/OH; 0 = NY
	• Study days	• Number of days in demonstration (range: 26–732)
• Nonmodifiable predisposing characteristics	• Age	• Number of years (range: 65–100)
	• Gender	• 1 = male; 0 = female
	• Race	• 1 = nonwhite; 0 = white
• Modifiable predisposing characteristics	• Education	• Less than high school graduate, high school graduate; reference category = more than high school graduate
	• Health beliefs[b]	
	• Health knowledge	• Three-item scale (range: 3–15)[c]
• Enabling factors[d]	• Annual household income	• Less than $10,000, $10,000–$19,999, $20,000–$29,999; reference category = $30,000 or more
	• Marital status	• Widowed, divorced or separated, never married; reference category = married
	• Number of close friends	• 0, 1, 2–5, 6–9, 10 or more
	• Number of close relatives	• 0, 1, 2–5, 6–9, 10 or more
	• Medicaid	• 1 = Medicaid; 0 = no Medicaid

Continued

APPENDIX 1—*Continued*

Category	Independent Variables	Definition
	● Medicare supplemental insurance	● 1 = Medicare supplemental insurance; 0 = no insurance
	● HMO	● 1 = Medicare HMO; 0 = no Medicare HMO
	● Private long-term care insurance[e]	● 1 = private long-term care insurance; 0 = no insurance
	● Rural/urban residence	● 1 = rural; 0 = urban
● Need variables	● Number of chronic conditions[f]	● List of 13 chronic health conditions (0–13)
	● Cognitive Performance Scale (CPS) score[g]	● CPS score (0–6): 0 = cognitively intact; 1 = borderline intact; 2+ = definite cognitive impairment
	● Number of activities of daily living (ADLs) in which person is dependent[h]	● Number of ADL dependencies (0–6): bathing, dressing, eating, toileting, transferring, and walking

Notes: [a]These variables are included in all regression models to allow combining data across site and to account for the assignment and exposure to the demonstration interventions.

[b]Given that personality traits overlap with both health values and attitudes (Marshall et al.1994), we controlled for health knowledge alone.

[c]A health knowledge score was derived from three questions: How knowledgeable are you about (1) the medicines you take? (2) the medical treatments you get? and (3) other things that can make you healthier? There was a five-item Likert-scale response for each question: not at all, slightly, moderately, quite a bit, and completely. The items were summed to make a scale. Internal consistency reliability (Cronbach's alpha) = 0.70.

[d]Refers to familial, interpersonal, or community-based resources that make health services more or less available and therefore more or less difficult to access.

[e]Included in nursing home, home care, and rehabilitation hospital use models.

[f]CMS 1998; internal consistency reliability (Cronbach's alpha) in the current sample = 0.46.

[g]Morris et al. 1994; validity: R^2 = .81 between CPS score and Mini Mental State Exam score (Landi et al. 2000).

[h]Shaughnessy, Crisler, and Schlenker 1997; internal consistency reliability (Cronbach's alpha) in the present sample = 0.74.

APPENDIX 2

Patient Baseline Characteristics ($N = 1,074$)

	Number/ Mean	Percent/ Standard Deviation
PERSONALITY TRAITS (range: 25–75)		
Neuroticism (mean, SD)	52.13	8.52
Extraversion (mean, SD)	46.11	8.12
Openness to experience (mean, SD)	43.87	7.66
Agreeableness (mean, SD)	47.81	8.84
Conscientiousness (mean, SD)	45.92	7.64
PREDISPOSING CHARACTERISTICS		
Nonmodifiable characteristics:		
● Age (mean, SD) (range: 65–100)	79.68	7.53
● Male gender	293	27.28
● Nonwhite race	30	2.79
Modifiable characteristics:		
Education		
● Less than high school graduate	416	38.73
● High school graduate	336	31.28
● More than high school graduate	322	29.98
Health knowledge scale (mean, SD) (range: 3–15)	11.42	2.50
ENABLING FACTORS		
Annual household income		
● Less than $10,000	354	32.96
● $10,000–$19,999	399	37.15
● $20,000–$29,999	186	17.32
● $30,000 or more	135	12.57
Marital status		
● Married	433	40.32
● Widowed	531	49.44
● Divorced or separated	70	6.52
● Never married	40	3.72
Number of close friends		
● 0	177	16.50
● 1	121	11.28
● 2–5	528	49.21
● 6–9	106	9.88
● 10 or more	141	13.14

APPENDIX 2—*Continued*

	Number/ Mean	Percent/ Standard Deviation
Number of close relatives		
● 0	77	7.18
● 1	113	10.53
● 2–5	510	47.53
● 6–9	162	15.10
● 10 or more	211	19.66
Medicaid	95	8.85
Medicare supplemental insurance	789	73.46
Medicare health maintenance organization (HMO)	128	11.92
Rural (non-metropolitan statistical area)	318	29.42
NEED VARIABLES		
Number of chronic conditions (range: 0–13) (mean, SD)	4.63	2.15
Cognitive Performance Scale (range: 0–6) (mean, SD)	0.82	0.87
Activities of daily living—dependence (range: 0–6) (mean, SD)	1.98	1.63
DEMONSTRATION CONTROLLING VARIABLES		
Intervention groups		
● Nurse intervention	263	24.49
● Voucher intervention	268	24.95
● Combination intervention	286	26.63
● Control group	257	23.93
Study site		
● New York	741	68.99
● West Virginia/Ohio	333	31.01
Number of study days (range: 26–732) (mean, SD)	622	199