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Drinking Patterns, Gender and Health II: Predictors of Preventive Service Use

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Abstract

Background—Chronic diseases and injuries are elevated among people with substance use problems/dependence, yet heavier drinkers use fewer routine and preventive health services than non-drinkers and moderate drinkers, while former drinkers and abstainers use more than moderate drinkers. Researchers hypothesize that drinking clusters with attitudes and practices that produce better health among moderate drinkers and that heavy drinkers avoid doctors until becoming ill, subsequently quitting and using more services. Gender differences in alcohol consumption, health-related attitudes, practices, and prevention-services use may affect these relationships.

Methods—A stratified random sample of health-plan members (7884; 2995 males, 4889 females) completed a mail survey that was linked to 24 months of health-plan records. Data were used to examine relationships between alcohol use, gender, health-related attitudes/practices, health, and prevention-service use.

Results—Controlling for attitudes, practices, and health, female lifelong abstainers *and* former drinkers were less likely to have mammograms; individuals with alcohol use disorders and positive AUDIT scores were less likely to obtain influenza vaccinations. AUDIT-positive women were less likely to undergo colorectal screening than AUDIT-positive men. Consistent predictors of prevention-services use were: self-report of having a primary care provider (positive); disliking visiting the doctor (negative); smoking cigarettes (negative), and higher BMI (negative).

Conclusions—When factors associated with drinking are controlled, patterns of alcohol consumption have limited effects on preventive service use. Individuals with stigmatized behaviors (e.g., hazardous/harmful drinking, smoking, or high BMIs) are less likely to receive care. Making care experiences positive and carefully addressing stigmatized health practices could increase preventive service use.

Keywords

Alcohol Drinking; Preventive Care; Gender; Health Status; Health Behaviors; Health-related Attitudes

INTRODUCTION

Risks for a host of health problems, including chronic diseases and injuries, are elevated among persons who abuse or are dependent on alcohol (US Department of Health and Human Services & National Institute on Alcohol Abuse and Alcoholism, 1997), while moderate drinking has been linked to better health and health-related outcomes (US Department of Health and Human Services & National Institute on Alcohol Abuse and Alcoholism, 2003; Gunzerath et al., 2004). Because medical “need” is one of the most important factors predicting use of health services (Holahan & Moos, 1991; Berki & Ashcraft, 1979; Evashwick et al., 1984; Muller, 1986; Mutran & Ferraro, 1988; Riley et al., 1993; Verbrugge & Patrick, 1995; Wolinsky et al., 1998), these alcohol-related health effects suggest that patterns of alcohol consumption should be related to patterns of health care use, with heavier drinkers using more health services and light-to-moderate drinkers using fewer. Yet, studies of these relationships have produced results that are inconsistent with this hypothesis. In most research reports, findings show heavier drinkers unexpectedly using fewer routine (non-emergency) and preventive services than non-drinkers and moderate drinkers, and former drinkers and abstainers using more routine services than moderate drinkers (Armstrong et al., 1998; Cherpitel, 1995; Cryer et al., 1999a; Haapanen-Niemi et al., 1999; Rice et al., 2000; Rodriguez-Artalejo et al., 2000; Zarkin et al., 2004).

These vexing findings have led researchers to consider possible mechanisms underlying these patterns, and speculations have led to several questions, including: 1) do patterns of alcohol use covary with other health-related attitudes and practices that are responsible for better health among those who drink moderately (e.g., they also use more preventive care and routine care, have better dietary and exercise patterns) and worse health among those who drink heavily (e.g., they are more likely to smoke), thus producing a spurious relationship between alcohol consumption and health? (US Department of Health and Human Services & National Institute on Alcohol Abuse and Alcoholism, 2003); and 2) do heavy consumers of alcohol avoid the doctor until they become ill, then subsequently quit drinking and use more services because they are ill (i.e., the “sick quitters” hypothesis), thus producing a spurious relationship between drinking pattern and health care service use (Armstrong et al., 1998; Rice et al., 2000). Some evidence has been brought to bear on these questions, but to date we have no definitive answers.

Clustering of health-related practices

There is good evidence for the clustering of positive health-related practices as well as risky behaviors. Liang and colleagues (1999) found that among men, having a medical checkup and cholesterol test formed one cluster, while among women, having a Pap smear and clinical breast examination (CBE) formed one cluster, while having a Pap smear, CBE, and mammogram formed a cluster for persons aged 55 and older. Risk behaviors also clustered differently by gender among younger age groups: among males, non-use of seatbelts, smoking, and drinking formed one cluster, and among females, one cluster was defined by drinking and driving after drinking (Liang et al., 1999). In a US population survey, Patterson and colleagues (1994) identified health behavior clusters in which drinking status played a role: One cluster was based on “drinking” while another was based on heavy drinking and smoking. Although this study did not generate gender-specific clusters, gender differences in

the clusters were pronounced, ranging from 64% female in the “good diet” group to 18% female in the “hedonic” (smoking and drinking) group.

Similarly, Slater and colleagues (1999) identified clusters of alcohol-related attitudes and behaviors associated with five drinking categories: non-drinkers, light drinkers, moderate drinkers, episodic drinkers, and regular heavy drinkers. Although health-care-seeking behaviors were not included in the definitions of the clusters, moderate drinkers had healthier lifestyles than the other groups. Gender differences between clusters were greatest between light drinkers and heavy drinkers (females comprised 63% and 21%, respectively). Similarly, Fillmore and colleagues’ (1998) meta-analysis explored whether health and health-related behaviors differed between lifetime abstainers and former drinkers and whether such differences might explain differential mortality between the 2 groups, or between non-drinkers and current drinkers. The authors found that adult male former drinkers were more likely than male lifetime abstainers to be heavier smokers, to be depressed, unemployed, have lower socioeconomic status, and to have used marijuana in the past. Adult female former drinkers were more likely than female lifetime abstainers to be heavier smokers, have poorer health, be less religious, and be unmarried.

In analyses of the sample used for the present paper, we found similar results (see Polen et al., 2010, companion paper #1): Frequency of heavy drinking was associated with worse health-related attitudes and values, worse feelings about visiting the doctor, and worse health-related practices. In addition, relationships between health-related practices and alcohol use differed by gender, and among current drinkers, daily or almost daily heavy drinking was associated with significantly lower physical and mental health for women compared to men. Drinking status (lifelong abstainers, former drinkers, and levels of regular alcohol consumption) was related to health status and vitality, even after adjusting for health-related attitudes, values, and practices. Relationships did not differ significantly by gender, and former drinkers had worse physical and mental health than lifelong abstainers and current drinkers.

Alcohol consumption and preventive services

Researchers examining the relationship between preventive service use and drinking patterns have found significant associations, although most have not simultaneously examined other health-related attitudes or practices. Fredman and colleagues (1999) controlled for demographic and health factors while examining effects of smoking and drinking on mammography rates. They found that white female current drinkers (age 50 and over) had significantly higher mammography rates than non-drinkers, and that non-smokers drinking 1–7 drinks per week had the highest mammography rates. Other researchers report that high-risk drinkers in primary care settings have elevated levels of other health risk behaviors (smoking, poor diet, and sedentariness), and are less likely than other patients with health risk behaviors to perceive their behavior as a problem (Rosal et al., 2000). In addition, these relationships appear similar in other cultural settings—in Spain, men and women with four behavioral risk factors (smoking, hazardous drinking, sedentariness, and poor diet) were less likely to comply with recommendations for blood pressure and cholesterol assessments, while among women, these risk factors were associated with lower likelihood of having a Pap test or mammography screening (Galan et al., 2006).

More comprehensive analyses that control for multiple indicators of health status and demographic factors suggest that abstainers and the heaviest drinkers are less likely to use preventive care than light-to-moderate drinkers (Urbanoski, 2003), and more likely to use acute or emergency care (Cryer et al., 1999b). Using similar adjustments in a different sample, our team found that lifelong abstainers and heavier drinkers used less preventive care and were less likely to try to improve their health-related practices than light-to-

moderate drinkers (Green & Polen, 2001) while former drinkers differed from light-to-moderate drinkers only in their tendency to smoke more.

Health-related attitudes and preventive services

To date, few reports have addressed the general relationship between use of preventive services and health-related attitudes. An exception is work by Fiscella (1998) showing that skepticism about the helpfulness of medical services is associated with worse health practices, lower levels of service use, including preventive care, and with 5-year mortality.

Summary

These complicated, and sometimes contradictory, findings indicate that more comprehensive models will need to be brought to bear if we are to adequately understand how drinking patterns affect use of preventive health care services. Such models need to examine, simultaneously, health-related attitudes, health-related practices, and gender differences, while including health status and systems level factors (e.g., copayments, having a primary care provider) that are known to affect use of health care services (Andersen, 1995). In this paper, we use survey, interview, and health plan records of preventive service use to address two critical questions: 1) does drinking pattern have an independent effect, above and beyond health-related practices and attitudes, health status and system factors, on use of preventive services—e.g., do risky drinkers avoid using preventive services?, and 2) are there gender differences in these relationships? We organize our analyses based on Andersen's (1995), model of health service utilization examining factors that predispose individuals to use services (e.g., sociodemographic characteristics, health-related attitudes, health-related practices) and factors that enable or impede service use (e.g., having a primary care provider, copayments, barriers to seeking care), while controlling for need factors (e.g., physical and mental health).

METHODS

Study setting

The study setting is Kaiser Permanente Northwest, a not-for-profit prepaid group practice health plan that provides outpatient and inpatient medical, mental health, and addiction services to about 480,000 people in northwest Oregon and southwest Washington State, USA. Details are described in Polen and colleagues (companion paper #1).

Sample and survey

Study participants were 2995 male and 4889 female (7884 total) HMO members aged 18–64 who responded to a Health & Health Practices survey conducted from October 2002 through mid-April 2003. Surveys were sent to 15,000 members (8500 women/6500 men) who had at least 12 months of health plan membership prior to sample extraction. Details on survey design, sampling methods, and characteristics of sample respondents and non-respondents are included in Polen and colleagues (companion paper #1).

Measures

Details on measures of socio-demographic characteristics, health-related attitudes and values, and other health-related practices are described in Polen and colleagues (companion paper #1). Measures included in analyses for the present paper, but not described in companion paper #1, are listed below.

Health-related practices—Respondents' were categorized based on their **drinking status** as: 1) lifelong abstainers (having consumed fewer than 12 drinks in their lifetimes),

former drinkers (used to drink but no longer drink), and current drinkers (over the prior 12 months). Current drinkers were categorized as averaging 0.5 to 29 drinks/month, 30–59 drinks/month, and 60 and over drinks per month. The upper two levels approximate cutoffs corresponding to the recommended daily limits in the US for women and men, respectively (no more than 1 drink/day for women and 2 drinks/day for men) (US Department of Health and Human Services & US Department of Agriculture, 2005). Overall, 8.9% of the women drank 30 or more drinks/month, and 8.8% of the men drank 60 or more drinks/month. Because the study focused on alcohol consumption, we excluded people who did not provide information about their drinking status (n=178).

We also computed an indicator of hazardous or harmful drinking, based on the Alcohol Use Disorders Test (AUDIT), a valid and reliable screening instrument for alcohol misuse (Babor et al., 2001). Current drinkers were classified as **AUDIT Positive** when they had AUDIT scores greater than or equal to 5, a cut-off that provides good sensitivity and specificity for alcohol misuse among men and women in the US (Bush et al., 1998; Bradley et al., 2003; Bradley et al., 2007). Overall, 14.5% of the women and 27.6% of the men were AUDIT positive. Under 1% of current drinkers had AUDIT scores of 20 or above, a level indicating a potential alcohol use disorder (Babor et al., 2001).

Barriers to care seeking and facilitators of care—We assessed several enabling factors that can function as barriers to seeking care.

Copayments were derived from health plan records at the time the survey was returned and included medical outpatient visit copayment (mean = \$9.43, *sd* = \$4.55) and behavioral health outpatient copayment (mean = \$14.22, *sd* = \$3.63). We also asked respondents to indicate how often (never, rarely, sometime, often) any of the following barriers made it difficult to see the doctor: childcare responsibilities, eldercare responsibilities, work schedule/responsibilities, financial difficulties, disability, transportation problems, and distance/travel time to doctor.

A **barriers to care index** was computed as a summation of all responses indicating a barrier “often” or “sometimes” made it difficult to seek care (mean = .99, *sd* = 1.03).

Regular doctor or primary care provider: We asked respondents if they had a regular doctor or primary care provider; responses were coded 1 = yes, 0 = no.

Health and functional status—Medical conditions were classified using the Kaiser Permanente Clinical-Behavioral Disease Classification System (Greenlick et al., 1988), updated for ICD-9-CM. This Ambulatory Diagnostic Group system organizes health problems into groups that share important dimensions—severity, etiology, duration, and anticipated use of medical care resources. The revised system has 19 categories (e.g., chronic disease, serious; malignancy, serious; reproductive, less serious) with 118 subgroups. All disease codes and V codes are assigned to a single appropriate category, simplifying diagnosis-related analyses. All diagnoses for the year prior to the survey were collected and classified using this system. The 15 most prevalent categories were combined into 5 binary indicators: serious illness (serious malignancy, serious congenital/neonatal, serious trauma, long-term care likely, other serious diagnosis), emotional/behavioral disorders, less serious conditions (less serious reproductive, other congenital/neonatal, less severe trauma, allergy/asthma), acute conditions (microorganism-related, acute non-microorganism), and chronic (chronic—continued care required, chronic—deterioration common, chronic—other). Finally, we also computed a pharmacy-based measure of chronic disease-based service use:

RxRisk is an updated version (Fishman et al., 2003a) of the Chronic Disease Score (Von Korff et al., 1992). It uses automated pharmacy data to construct a measure of severity of comorbid chronic disease that predicts hospitalization and mortality in the following year. The RxRisk produces an overall predictive risk score for the year following the 12 months for which it is calculated (Fishman et al., 2003b).

Diagnoses of depression, alcohol abuse, and alcohol dependence: Using health plan records, we created binary indicators for having a diagnosis of depression or a diagnosis of alcohol abuse or dependence in the year prior to survey return.

Preventive services—Measures of preventive services were derived from health plan service records in the year prior to and year following each respondent's survey return date. Health plan and national recommendations were used to specify appropriate age ranges and periods over which each service should be received.

Health plan membership: We counted months of membership in the 12-month period following survey return (all respondents had 12 months of membership prior to being sent the survey). This measure was used to control for access to care in all analyses of the 12 months following survey return; individuals with membership of 1 month or less in the post-survey period were dropped from the analyses.

PSA (prostate-specific antigen) test: Receipt of a PSA screening for prostate cancer was assessed for the 12-month period pre and the 12-month period post survey for men age 50 and over. This binary variable was given a value of 1 if the test was received in the two-year pre-post period and 0 if the test was not received. KPNW recommends that men discuss with their health care provider the need for prostate cancer screening between ages 50 and 70. AHRQ (US Department of Health and Human Services et al., 2003a) recommends that men discuss the benefits and harms of prostate cancer screening, including PSA, with their doctor.

Pap (Papanicolaou) test or smear: Receipt of a Pap test to screen for cervical cancer was assessed for the 12-month period pre and the 12-month period post survey for women. This binary variable was given a value of 1 if the test was received in the two-year pre-post period and 0 if the test was not received. KPNW recommends that women receive a Pap test every 3 years following 3 normal annual tests before age 70. AHRQ recommends women have a Pap smear every 1 to 3 years if sexually active or older than 21 (US Department of Health and Human Services et al., 2003b).

Mammogram: Receipt of a screening mammogram (diagnostic mammograms were excluded) for breast cancer was assessed for the 12-month period pre and the 12-month period post survey in women age 40 and over. This binary variable was given a value of 1 if the test was received in the two-year pre-post period and 0 if the test was not received. KPNW recommends that women between 40 and 75 have a mammogram at least every 2 years; those younger than 40 and older than 75 who wish to be screened are counseled to check with their care provider. AHRQ recommends that women receive a mammogram every 1 or 2 years beginning at age 40 (US Department of Health and Human Services et al., 2003b).

Annual gynecological examination: We created a binary indicator for women who had a visit in the obstetrics/gynecology department with a diagnosis of "routine gynecological exam" for the 12-month period pre and the 12-month period post survey. Neither KPNW nor

AHRQ makes recommendations for such exams beyond those for mammograms and Pap tests.

Cholesterol screen: Receipt of a cholesterol screening blood test was assessed for the 12-month period pre- and the 12-month period post-survey return for all respondents. This binary variable was given a value of 1 if the test was received in the two-year pre-post period and 0 if the test was not received. KPNW recommends that cholesterol be checked every 5 years starting at age 45. AHRQ recommends that men have cholesterol checked every 5 years starting at age 35 and women starting at age 45; if a person smokes or has diabetes, or if heart disease runs in the family, testing should begin at age 20. Because we had access to only 2 years of data, we were limited to a two-year period rather than the five-year period we would have preferred.

Influenza vaccination: Receipt of a flu vaccination was assessed for the 12-month period pre and the 12-month period post survey for all respondents. This binary variable was given a value of 1 if the vaccination was received in the two-year pre-post period and 0 if the vaccination was not received. KPNW recommends an influenza vaccination every year if a person is at high risk of infection and for those age 50 or over. AHRQ recommends vaccinations every year starting at age 50 (US Department of Health and Human Services et al., 2003a; US Department of Health and Human Services et al., 2003b). We chose to use a two-year period to account for the likelihood that individuals would receive a vaccination in each year but not exactly within a 12-month period. Because the health plan makes influenza vaccinations available to all members, we did not limit by age or health status (although we did control for them in analyses).

Colorectal cancer test: Receipt of a colorectal cancer test was assessed for the 12-month period pre and the 12-month period post survey in persons age 50 and over. This binary variable was given a value of 1 if the test was received in the two-year pre-post period and 0 if the test was not received. KPNW recommends that persons between ages 55 and 65 receive a test for colon cancer. AHRQ recommends that men and women begin receiving regular screening for colorectal cancer starting at age 50, choosing the type of test with help from the care provider, who should determine the interval between tests (US Department of Health and Human Services et al., 2003a; US Department of Health and Human Services et al., 2003b).

Analyses

We explored the relationship between sets of independent variables and measures of preventive service use in a two-step process. First, independent variables were grouped according to whether they were predisposing factors, enabling factors, or need factors, according to the Andersen model of health services use (Andersen, 1995). Predisposing factors were further broken down into 1) demographic characteristics, 2) health-related attitudes, and 3) health-related practices. We then regressed each indicator of preventive service use on the independent variables in each block in separate logistic regression equations, for a total of five regression analyses for each outcome. Every analysis controlled for months of health plan eligibility during the two-year period and evaluated the effects of gender, alcohol use (with separate models for drinking status and the AUDIT positive variables), and included gender by alcohol variable interactions as independent variables.

For each logistic regression analysis, we noted independent variables that were significantly related to a particular outcome at alpha $.05$. Significant predictors for each outcome variable from each block were then simultaneously entered into one regression equation (non-significant variables were dropped) to determine which variables remained uniquely

predictive. For each outcome variable, if the interaction of gender and alcohol use was not significant, we performed a regression analysis without the interaction term and report those results. We evaluated all tests of statistical significance using robust estimates of the standard error and report all parameter estimates as odds ratios.

To make our measures consistent with guidelines, analyses for PSA tests were restricted to men ages 50 and over, analyses of Pap tests and annual gynecological exams were restricted to women. Mammograms were restricted to women age 40 and over and colorectal cancer tests to participants age 50 and over.

RESULTS

Results of logistic regression analyses examining the relationships between drinking pattern, gender, blocks of key independent variables, and use of preventive services, appear in Table 1. To reduce complexity of the table we have not included coefficients for control variables: age, months of health plan membership, and health status. Because of the multiple tests run, only results with alphas ≤ 0.01 are reported as significant. The reference group for drinking status was those drinking between 0.5 and 29 drinks/month.

Overall, models explained between 5% (for colorectal cancer screenings) and 26% (for cholesterol screenings) of the variance in use of preventive services. Most importantly, after health related attitudes, health-related behaviors, and health were included in the models, there was little evidence that alcohol use was related to use of preventive services. The exceptions to this finding were 1) that female non-drinkers—both lifelong abstainers *and* former drinkers—were less likely to receive a mammogram, and 2) individuals with prior year diagnoses of alcohol problems were half as likely as other individuals to receive an influenza vaccination. Similarly, when all factors were taken into account, female gender predicted only cholesterol screenings (negatively) and influenza vaccinations (positively).

Across analyses, the most consistent predictors of preventive service use were: 1) self-report of having a primary care provider, which was associated with greater likelihood of having a PSA test, Pap test, mammogram, cholesterol screen, influenza vaccine, and colorectal cancer screen, but lower likelihood of having an annual gynecological exam with a gynecologist (most likely because these exams were conducted by primary care providers); 2) disliking visiting the doctor, which was associated with fewer Pap tests, fewer mammograms, fewer cholesterol screens, and fewer influenza vaccinations; 3) smoking cigarettes (associated with lower likelihood of a PSA test, mammogram, cholesterol screen, annual gynecological exam, and influenza vaccine), and 4) higher BMI, associated with lower likelihood of receiving Pap tests, mammograms, and colorectal cancer screens, but greater likelihood of receiving a cholesterol screen.

Being married was associated with more preventive service use—PSA tests for men, influenza vaccinations, and colorectal cancer screenings. Similarly, higher education was related to increased likelihood of cholesterol screenings and influenza vaccinations. More frequent breakfast consumption was related to increased likelihood of receiving a Pap test, a mammogram, and an influenza vaccine.

Other attitudinal variables were most likely to be associated with receiving an influenza vaccination, but not other service use—these included being concerned that the doctor might disapprove of health-related practices (positively related), believing that if one becomes sick it is one's own behavior that determines getting well (negatively related), believing that good health is a matter of good fortune (positively related), that an exciting life is important (positive relationship), and feeling that the respect and admiration of others is important (negative relationship).

Health care self-efficacy was related to receiving a PSA test—perhaps because recommendations suggest discussing this test with health care providers to make a decision about whether it is appropriate.

Among remaining enabling factors, higher copayments were related to reduced likelihood of receiving a mammogram, an annual gynecological exam, and an influenza vaccine (despite the last not requiring a copayment), while higher income was associated with greater likelihood of receiving Pap tests and mammograms.

Variables that were *not* predictive in any equation included the SF-36 Mental Health scale, SF-36 Vitality scale, total barriers to care, behavioral health copayment, coping strategies, usual hours of sleep, five-plus fruits or vegetables/day, and interaction terms for drinking status by gender.

We repeated the same sets of analyses among current drinkers, assessing the effects of hazardous or harmful drinking on use of preventive services using the AUDIT-positive measure in lieu of the drinking status measure. These results appear in Table 2 and are generally consistent with the findings reported for the full sample. An exception is that individuals with positive AUDIT scores were significantly less likely to receive an influenza vaccine, and there was a significant gender by AUDIT-positive interaction. For this latter finding, women who were AUDIT positive were less likely to receive a colorectal cancer screen than men who were AUDIT positive.

DISCUSSION

We found only minimal evidence supporting the hypothesis that patterns of alcohol consumption affect willingness to seek preventive services, although we did find that individuals with alcohol use disorders and individuals who scored 5 or higher on the AUDIT were less likely to receive an influenza vaccination.

In general, our findings provide much stronger support for the hypothesis that alcohol consumption covaries with other health-related practices and attitudes (see Polen et al., companion paper #1) that are more strongly related to use of preventive care. Interestingly, across types of services, it was influenza vaccination that had the largest number of relationships with the sociodemographic, attitudinal, and behavioral variables. This pattern provides an interesting comparison, because influenza vaccinations are delivered differently from other services—the health plan has “flu shot clinics” at each service site and members may “walk in” to the clinic without an appointment, physician prescription or referral. Influenza vaccine importance is well publicized, not only within KP, but in the larger public media, and vaccinations are provided at no cost. In such cases, where access is completely open, one would expect that factors inherent to the individual would play a greater role than would be the case when access is more complicated (e.g., requiring a referral or an appointment).

We also found evidence that enabling factors—income and copayments—have important effects on use of preventive care, particularly among women (for mammograms and Pap tests). The fact that there is a negative relationship between copayment and receipt of influenza vaccine, even when no copayment applies, suggests an undesirably pervasive effect of copayments on service use.

Finally, we found little evidence of gender by alcohol consumption interactions in these relationships, or for main effects of gender when other factors were included in the models. This finding is inconsistent with prior work suggesting that women in general are more likely to seek health care services (Green & Pope, 1999; Verbrugge & Patrick, 1995;

Bertakis et al., 2000) but consistent with the idea that gender is a proxy for a series of attitudinal, behavioral, and enabling factors that, when included in equations, account for variance that might otherwise be accounted for by gender. This is supported by our finding that gender differences in service use disappeared when later blocks of explanatory measures were entered into the equations.

Limitations

Some of the preventive services we examined have recommendations for screenings that are less frequent than the period for which we had data—this suggests that our findings (such as for colorectal screening) show weaker relationships than would be the case if we had 5 years of data to examine rather than 2 years of data. In addition, our response rate was less than hoped for. Fortunately, we are able to describe non-respondents to some extent to provide information about possible biases in the sample. A strength of the study, however, is that preventive service use was based on health-plan data rather than self-report.

CONCLUSIONS

Our results suggest that individuals with stigmatized conditions or practices—alcohol use disorders, hazardous drinking, smoking, higher BMIs—are less likely to receive preventive services, but that of these, smoking is by far the most important behavioral factor. In the context of our other findings: 1) that individuals who dislike visiting the doctor receive fewer such services, 2) that individuals who engage in frequent heavy drinking report attitudes that might negatively affect care seeking (Polen et al., companion paper #1), and 3) that those who have a primary care provider receive more preventive services—these findings suggest avenues for increasing use of preventive care. It is possible that the recent recognition of the importance of continuity with primary care providers and consequent efforts by health plans to pair individuals with such providers (Schultz, 1995) will have positive effects on preventive service use, particularly if clinicians can improve the experience of individuals seeking care and more carefully address stigmatized behaviors like smoking and alcohol problems, or conditions such as being overweight. Such efforts might help people seek more preventive care in the future, but it is noteworthy that one possible explanation for the negative effects of smoking on service use is that so many interventions have targeted this health practice. As brief screenings and interventions for alcohol use increase in primary care settings (as recommended by the US Preventive Services Task Force (Whitlock et al., 2004; US Preventive Services Task Force, 2004), it is possible that these interventions may lead to increased concerns about seeking care among individuals with hazardous drinking patterns.

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Reference List

- Andersen RM. Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior*. 1995; 36:1–10. [PubMed: 7738325]
- Armstrong MA, Midanik LT, Klatsky AL. Alcohol consumption and utilization of health services in a health maintenance organization. *Medical Care*. 1998; 36:1599–1605. [PubMed: 9821947]
- Babor, TF.; Higgins-Biddle, JC.; Saunders, JB.; Monteiro, MG. AUDIT: The Alcohol Use Disorders Identification Test. Guidelines for use in primary care. 2. World Health Organization; 2001. p. 1-40.

- Berki SE, Ashcraft ML. On the analysis of ambulatory utilization: an investigation of the roles of need, access and price as predictors of illness and preventive visits. *Medical Care*. 1979; 17:1163–1181. [PubMed: 513882]
- Bertakis KD, Azari R, Helms LJ, Callahan EJ, Robbins JA. Gender differences in the utilization of health care services. *Journal of Family Practice*. 2000; 49:147–152. [PubMed: 10718692]
- Bradley KA, Bush KR, Epler AJ, Dobie DJ, Davis TM, Sporleder JL, et al. Two brief alcohol-screening tests From the Alcohol Use Disorders Identification Test (AUDIT): Validation in a female Veterans Affairs patient population. *Archives of Internal Medicine*. 2003; 163:821–829. [PubMed: 12695273]
- Bradley KA, Debenedetti AF, Volk RJ, Williams EC, Frank D, Kivlahan DR. AUDIT-C as a brief screen for alcohol misuse in primary care. *Alcoholism, Clinical and Experimental Research*. 2007; 31:1208–1217.
- Bush KR, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. *Archives of Internal Medicine*. 1998; 158:1789–1795. [PubMed: 9738608]
- Cherpitel CJ. Alcohol use among HMO patients in the emergency room, primary care and the general population. *Journal of Studies on Alcohol*. 1995; 56:272–276. [PubMed: 7623464]
- Cryer PC, Jenkins LM, Cook AC, Ditchburn JS, Harris CK, Davis AR, et al. The use of acute and preventative medical services by a general population: Relationship to alcohol consumption. *Addiction*. 1999a; 94:1523–1532. [PubMed: 10790904]
- Cryer PC, Jenkins LM, Cook AC, Ditchburn JS, Harris CK, Davis AR, et al. The use of acute and preventative medical services by a general population: relationship to alcohol consumption. *Addiction*. 1999b; 94:1523–1532. [PubMed: 10790904]
- Evashwick C, Rowe G, Diehr P, Branch L. Factors explaining the use of health care services by the elderly. *Health Services Research*. 1984; 19:357–382. [PubMed: 6746297]
- Fillmore KM, Golding JM, Graves KL, Knip S, Leino EV, Romelsjo A, et al. Alcohol consumption and mortality. I. Characteristics of drinking groups. *Addiction*. 1998; 93:183–203. [PubMed: 9624721]
- Fiscella K, Franks P, Clancy CM. Skepticism toward medical care and health care utilization. *Medical Care*. 1998; 36:180–189. [PubMed: 9475472]
- Fishman PA, Goodman MJ, Hornbrook MC, Meenan RT, Bachman DJ, O’Keeffe Rosetti MC. Risk adjustment using automated ambulatory pharmacy data: the RxRisk model. *Medical Care*. 2003b; 41:84–99. [PubMed: 12544546]
- Fishman PA, Goodman MJ, Hornbrook MC, Meenan RT, Bachman DJ, O’Keeffe Rosetti MC. Risk adjustment using automated ambulatory pharmacy data: the RxRisk model. *Medical Care*. 2003a; 41:84–99. [PubMed: 12544546]
- Fredman L, Sexton M, Cui Y, Althuis M, Wehren L, Hornbeck P, et al. Cigarette smoking, alcohol consumption, and screening mammography among women ages 50 and older. *Preventive Medicine*. 1999; 28:407–417. [PubMed: 10090870]
- Galan I, Rodriguez-Artalejo F, Diez-Ganan L, Tobias A, Zorrilla B, Gandarillas A. Clustering of behavioural risk factors and compliance with clinical preventive recommendations in Spain. *Preventive Medicine*. 2006; 42:343–347. [PubMed: 16545444]
- Green CA, Polen MR. The health and health behaviors of people who do not drink alcohol. *American Journal of Preventive Medicine*. 2001; 21:298–305. [PubMed: 11701301]
- Green CA, Pope CR. Gender, psychosocial factors and the use of medical services: A longitudinal analysis. *Social Science and Medicine*. 1999; 48:1363–1372. [PubMed: 10369437]
- Greenlick, MR.; Freeborn, DK.; Pope, CR. *Health care research in an HMO: Two decades of discovery*. Baltimore, Maryland: The Johns Hopkins University Press; 1988.
- Gunzerath L, Faden V, Zakhari S, Warren K. National Institute on Alcohol Abuse and Alcoholism report on moderate drinking. *Alcoholism, Clinical and Experimental Research*. 2004; 28:829–847.
- Haapanen-Niemi N, Miilunpalo S, Vuori I, Pasanen M, Oja P. The impact of smoking, alcohol consumption, and physical activity on use of hospital services. *American Journal of Public Health*. 1999; 89:691–698. [PubMed: 10224980]

- Holahan CJ, Moos RH. Life stressors, personal and social resources, and depression: a 4-year structural model. *Journal of Abnormal Psychology*. 1991; 100:31–38. [PubMed: 2005268]
- Liang W, Shediak-Rizkallah MC, Celentano DD, Rohde C. A population-based study of age and gender differences in patterns of health-related behaviors. *American Journal of Preventive Medicine*. 1999; 17:8–17. [PubMed: 10429747]
- Muller C. Review of twenty years of research on medical care utilization. *Health Services Research*. 1986; 21:129–144. [PubMed: 3525467]
- Mutran E, Ferraro KF. Medical need and use of services among older men and women. *Journal of Gerontology*. 1988; 43:S162–S171. [PubMed: 2971089]
- Patterson RE, Haines PS, Popkin BM. Health lifestyle patterns of U.S. adults. *Preventive Medicine*. 1994; 23:453–460. [PubMed: 7971872]
- Polen MR, Green CA, Perrin NA, Anderson BM, Weisner CM. Companion Paper #1). Drinking Patterns, Gender and Health I: Attitudes and Health Practices. *Addiction Theory & Research*. 2010; ???-??-??.
- Rice DP, Conell C, Weisner CM, Hunkeler EM, Fireman B, Hu TW. Alcohol drinking patterns and medical care use in an HMO setting. *Journal of Behavioral Health Services & Research*. 2000; 27:3–16. [PubMed: 10695237]
- Riley AW, Finney JW, Mellits ED, Starfield B, Kidwell S, Quaskey S, et al. Determinants of children's health care use: an investigation of psychosocial factors. *Medical Care*. 1993; 31:767–783. [PubMed: 8366679]
- Rodriguez-Artalejo F, de Andres Manzano B, Guallar-Castillon P, Puente Mendizabal MT, Gonzalez Enriquez J, del Rey Calero J. The association of tobacco and alcohol consumption with the use of health care services in Spain. *Preventive Medicine*. 2000; 31:554–561. [PubMed: 11071836]
- Rosal MC, Ockene JK, Hurley TG, Reiff S. Prevalence and co-occurrence of health risk behaviors among high-risk drinkers in a primary care population. *Preventive Medicine*. 2000; 31:140–147. [PubMed: 10938214]
- Schultz DV. The importance of primary care providers in integrated systems. *Healthcare Financial Management*. 1995; 49:58–63. [PubMed: 10146128]
- Slater MD, Basil MD, Maibach EW. A cluster analysis of alcohol-related attitudes and behaviors in the general population. *Journal of Studies on Alcohol*. 1999; 60:667–674. [PubMed: 10487737]
- Urbanoski KA. The use of preventive healthcare by Canadian women who drink alcohol. *Preventive Medicine*. 2003; 37:334–341. [PubMed: 14507490]
- US Department of Health and Human Services, Agency for Healthcare Research and Quality, & US Preventive Services Task Force. Men: Stay healthy at any age. Checklist for your next checkup. 2003a. AHRQ Pub. No. APPIP03–0011
- US Department of Health and Human Services, Agency for Healthcare Research and Quality, & US Preventive Services Task Force. Women: Stay healthy at any age. Checklist for your next checkup. 2003b. AHRQ Pub. No. APPIP03–0008
- US Department of Health and Human Services & National institute on Alcohol Abuse and Alcoholism. Ninth special report to the US Congress on alcohol and health. 1997. (Rep. No. NIH Publication No. 97–4017)
- US Department of Health and Human Services & National institute on Alcohol Abuse and Alcoholism. State of the science report on the effects of moderate drinking. 2003.
- US Department of Health and Human Services & US Department of Agriculture. Dietary guidelines for Americans, 2005 (Rep No). 6. Washington, DC: US Government Printing Office; 2005.
- US Preventive Services Task Force. Screening and behavioral counseling interventions in primary care to reduce alcohol misuse: Recommendation statement. *Annals of Internal Medicine*. 2004; 140:554–556. [PubMed: 15068984]
- Verbrugge LM, Patrick DL. Seven chronic conditions: Their impact on US adults' activity levels and use of medical services. *American Journal of Public Health*. 1995; 85:173–182. [PubMed: 7856776]
- Von Korff M, Wagner EH, Saunders K. A chronic disease score from automated pharmacy data. *Journal of Clinical Epidemiology*. 1992; 45:197–203. [PubMed: 1573438]

- Whitlock EP, Polen MR, Green CA, Orleans T, Klein J. Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: A summary of the evidence for the U.S. Preventive Services Task Force. *Annals of Internal Medicine*. 2004; 140:557–568. [PubMed: 15068985]
- Wolinsky FD, Wan GJ, Tierney WM. Changes in the SF-36 in 12 months in a clinical sample of disadvantaged older adults. *Medical Care*. 1998; 36:1589–1598. [PubMed: 9821946]
- Zarkin GA, Bray JW, Babor TF, Higgins-Biddle JC. Alcohol drinking patterns and health care utilization in a managed care organization. *Health Services Research*. 2004; 39:553–570. [PubMed: 15149478]

Table 1

Results of logistic regression analyses predicting preventive service use. Alcohol measure is drinking status.¹

	PSA test (men only)	Pap test, ordered & performed (women only)	Mammograms received (women only)	Annual Gynecological Exam (women only)	Cholesterol screen	Influenza Vaccine	Colorectal Cancer Test
Lifelong abstainers	-	-	0.61(0.49-0.77) ****	-	-	-	-
Former drinkers	-	-	0.77(0.62-0.96) **	-	-	-	-
Drink 30-59 drinks/month	-	-	-	-	-	-	-
Drink 60 or more drinks/month	-	-	-	-	-	-	-
Female gender	-	-	-	-	0.84(0.74-0.95) **	1.24(1.11-1.40) ****	-
White	-	-	-	-	-	-	-
Hispanic ethnicity	-	1.46(1.03-2.07) *	-	-	-	-	-
Adjusted income (per \$10,000)	-	1.005(1.001-1.009) *	1.02(1.0034-1.016) ****	-	-	-	-
Married	1.42(1.08-1.90) *	-	-	-	-	1.15(1.03-1.30) **	1.42(1.10-1.84) **
Employed	-	-	-	-	-	-	0.75(0.59-0.95) *
Education level	1.16(1.04-1.30) **	-	-	-	1.08(1.03-1.14) **	1.08(1.03-1.14) **	-
Dislike going to doctor	-	0.81(0.74-0.89) ****	0.74(0.65-0.83) ****	-	0.83(0.76-0.90) ****	0.85(0.78-0.92) ****	-
Concerned Dr. might disapprove of health practices	-	-	-	-	-	1.09(1.00-1.19) *	-
If sick, own behavior determines getting well	-	-	-	-	-	0.93(0.89-0.98) **	-
Good health is a matter of good fortune	-	-	-	-	-	1.05(1.01-1.10) *	-
Exciting life important	-	-	-	-	-	1.10(1.01-1.19) *	-
Religious & spiritual beliefs important	-	-	-	0.87(0.77-0.99) *	-	-	-
Respect & admiration of others important	-	-	-	-	-	0.90(0.82-0.99) *	-
Self-efficacy in health care settings	1.04(1.01-1.08) *	-	-	-	*	-	-

	PSA test (men only)	Pap test, ordered & performed (women only)	Mammograms received (women only)	Annual Gynecological Exam (women only)	Cholesterol screen	Influenza Vaccine	Colorectal Cancer Test
How often use seat belts	-	-	-	-	-	1.39(1.22-1.58)***	-
How often eat breakfast	-	1.12(1.03-1.22)*	1.17(1.04-1.31)**	-	-	1.21(1.12-1.31)***	-
Days exercised, past week	-	-	-	-	-	-	1.07(1.02-1.12)**
Current smoker	0.71(0.52-0.96)*	-	0.64(0.51-0.80)***	0.69(0.54-0.89)**	0.80(0.70-0.93)**	0.78(0.67-0.90)**	-
Office visit copayment	-	-	0.96(0.94-0.98)***	0.97(0.95-0.99)**	-	0.98(0.97-0.99)***	-
Have primary care provider	1.64(1.22-2.19)**	1.34(1.15-1.56)***	1.33(1.08-1.62)**	0.77(0.63-0.94)**	1.46(1.29-1.65)***	1.44(1.26-1.64)***	1.50(1.06-2.11)*
Diagnosis of alcohol problem, prior 12 months	-	-	-	-	-	0.51(0.32-0.82)**	-
BMI	-	0.99(0.98-0.99)*	0.98(0.97-0.99)**	-	1.03(1.02-1.04)***	-	0.98(0.96-0.99)*
Nagelkerke R^2	.12	.06	.13	.05	.26	.23	.05

Note:

* $p < .05$,

** $p < .01$,

*** $p < .001$,

**** $p < .0001$;

analyses controlled for age, ambulatory diagnostic groups, self-reported health status (SF-36 general health, mental health, vitality), RxRisk score, depression diagnosis in the year prior to survey return, and months of health plan membership; variables that were not predictive of any service use measure are as follows: Barriers to care, behavioral health office visit copayment, passive coping, active coping, coping with alcohol or by smoking, usual hours of sleep, consuming 5 or more fruits/vegetables per day, and all drinking status by gender interaction terms.

Table 2
Results of logistic regression analyses predicting preventive service use. Alcohol measure is scoring positive on the AUDIT.¹

	PSA test (men only)	Pap test, ordered & performed (women only)	Mammograms received (women only)	Annual Gynecological Exam (women only)	Cholesterol screen	Influenza Vaccine	Colorectal Cancer Test
AUDIT Positive	-	-	-	-	-	0.83(0.72-0.96)**	-
Female gender	-	-	-	-	0.78(0.68-0.90)**	-	-
Gender x AUDIT Positive	-	-	-	-	-	-	0.33(0.16-0.68)**
White	-	-	-	-	-	0.78(0.64-0.94)*	-
Adjusted income (per \$10000)	-	-	1.009(1.001-1.016)*	-	-	-	-
Married	1.53(1.10-2.14)*	-	-	-	-	1.21(1.05-1.39)**	1.41(1.02-1.94)*
Employed	-	1.24(1.04-1.48)*	-	-	-	0.72(0.62-0.84)***	0.70(0.53-0.94)*
Education level	1.23(1.08-1.41)**	1.09(1.01-1.17)*	-	-	1.10(1.03-1.17)**	1.10(1.03-1.17)**	-
Dislike going to doctor	-	0.83(0.74-0.93)**	0.66(0.56-0.78)***	-	0.85(0.77-0.94)**	0.83(0.75-0.92)**	-
If sick, own behavior determines getting well	-	-	-	-	-	0.93(0.88-0.99)*	-
Good health is a matter of good fortune	-	-	-	-	-	1.08(1.02-1.13)**	-
Exciting life important	-	-	-	-	-	-	-
Religious & spiritual beliefs important	-	-	-	0.86(0.74-0.99)*	-	-	-
Self-efficacy in health care settings	1.05(1.01-1.09)*	-	-	-	1.02(1.00-1.04)*	-	-
How often use seat belts	-	-	-	-	-	1.30(1.11-1.52)**	-
How often eat breakfast	-	-	-	-	-	1.22(1.11-1.33)***	-
Days exercised, past week	-	-	-	1.06(1.01-1.11)*	-	-	1.06(1.002-1.13)*
Current smoker	0.72(0.50-1.05)*	-	0.61(0.47-0.80)***	0.64(0.48-0.85)**	0.81(0.68-0.95)*	-	0.63(0.40-0.97)*
Copes passively	-	-	-	0.69(0.53-0.90)**	-	-	-
Office visit copayment	-	-	0.97(0.94-0.99)**	-	-	0.98(0.97-0.99)**	-

	PSA test (men only)	Pap test, ordered & performed (women only)	Mammograms received (women only)	Annual Gynecological Exam (women only)	Cholesterol screen	Influenza Vaccine	Colorectal Cancer Test
Have primary care provider	1.73(1.23-2.44)***	1.40(1.17-1.68)***	-	0.77(0.60-0.98)*	1.54(1.33-1.78)***	1.41(1.20-1.65)***	-
BMI	-	-	-	-	1.03(1.02-1.04)****	-	0.97(0.94-0.99)**
Diagnosis of alcohol problem, prior 12 months	-	-	-	-	-	0.52(0.28-0.96)*	-
Nagelkerke R²	.14	.05	.13	.04	.26	.23	.06

Note:

* p < .05,

** p < .01,

*** p < .001,

**** p < .0001,

analyses controlled for age, ambulatory diagnostic groups, self-reported health status (SF-36 general health, mental health, vitality), RxRisk score, depression diagnosis in the year prior to survey return, and months of health plan membership; variables that were not predictive of any service use measure are as follows: Hispanic ethnicity, barriers to care, behavioral health office visit copayment, active coping, coping with alcohol or by smoking, usual hours of sleep, consuming 5 or more fruits/vegetables per day, being concerned that the doctor might disapprove of health practices, believing that it is better to seek professional help than to treat oneself, indicating that a comfortable life is important, and indicating that the respect and admiration of others is important.