

Published in final edited form as:

J Subst Use. 2007 June 1; 12(3): . doi:10.1080/14659890701237215.

Practitioner-level predictors of alcohol problems detection and management activities

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Abstract

The alcohol health services literature suggests that a potential problem with promoting secondary prevention is an existing educational focus on alcohol dependency.

Aims—This study explores practitioner-level predictors of health professionals' self-reported detection and management activities in an effort to inform this question.

Participants—The participants consisted of a random sample of licensed physicians and nurse practitioners in a northern California county.

Measurement—Participants completed a self-administered questionnaire on beliefs and practices regarding patients with alcohol problems and at-risk drinkers.

Findings—The results indicate that prior alcohol education predicted clinical practices to address known or suspected drinking problems, but not those at-risk or without observable symptoms. In addition, stigmatizing beliefs about problem drinkers discouraged use of blood tests even when awareness of a drinking problem existed.

Conclusions—The conclusions are that existing models of alcohol education appear to convey a tertiary focus, and do not cover secondary prevention sufficiently to challenge the deficits and beliefs that discourage early detection and intervention.

Keywords

Secondary prevention; alcohol education; screening; brief intervention

Introduction

Alcohol use and misuse is the third leading cause of preventable death in the USA (Mokdad, Marks, Stroup, & Gerberding, 2004). Alcohol consumption contributes to a range of acute and chronic medical consequences; these include accidental injury, major depression, and cardiovascular diseases (Rehm, Gmel, Sempos, & Trevisan, 2002). A substantial proportion of these consequences are experienced by people with mild to moderate alcohol problems. Focusing intervention on this population could therefore achieve significant reduction in harm (Institute of Medicine, 1990). Studies have shown multiple benefits of secondary prevention services in primary care settings. They can reduce alcohol consumption (Chick, Lloyd, & Crombie, 1985; Wallace, Cutler, & Haines, 1988; Bien, Miller, & Tonigan, 1993; Kahn, Wilson, & Becker, 1995; Israel, Hollander, Sanchez-Craig, Booker, Miller, Gingerich, & Rankin, 1996; World Health Organization, 1996; Fleming, Barry, Manwell,

Johnson, & London, 1997; Wilk, Jensen, & Havighurst, 1997; Fleming, Barry, Adams, & Stauffacher, 1999; Ockene, Adams, Hurley, Wheeler, & Herbert, 2000; Moyer, Finney, Swearingen, & Vergun, 2002). In addition, they can reduce hospital stays, sick days and mortality (Kristenson, Ohlin, Hulten-Nosslin, Trell, & Hood, 1983). They can reduce health care utilization and produce overall cost savings (Fleming *et al.*, 1997). They can also reduce number of injuries that require emergency department treatment (Gentillo, Rivara, Donovan, Jurkovich, Daranciang, Dunn, Villavoces, Copass, & Ries, 1999). Education of health care practitioners has been shown to increase their offering alcohol prevention services (Rowland, Maynard, Kennedy, Wintersgill, & Stone, 1988; Gorman, Werner, Jacobs, & Duffy, 1990; Adams, Ockene, Wheeler, & Hurley, 1998; Babor, Higgins-Biddle, Higgins, Gassman, & Gould, 2004; Saitz, Sullivan, & Samet, 2000). However, generally, medical professionals do not routinely screen for alcohol problems (Institute of Medicine, 1990; Ford, Klag, Whelton, Goldsmith, & Levine, 1994; Kitchen, 1994; El-Gruebaly, Lockyer, Drought, Parboosingh, Juschka, Weston, Campbell, & Chang, 1995; Mezy, 1995; Edmunds, Frank, Hogan, McCarty, Robinson-Beale, & Weisner, 1997; Saitz, Mulvey, Plough, & Samet, 1997; Smothers, Yahr, & Ruhl, 2004; Spandorfer, Israel, & Turner, 1999; Center for Substance Abuse Treatment, 2000). Research has identified a variety of reasons that health professionals may fail to screen. Education efforts that focus on alcohol dependency and typically requires treatment tends not to promote secondary prevention (Geller, Levine, Mamon, Moore, Bone, & Stokes, 1989; Gopalan, Santora, Stokes, Moore, & Levine, 1992; El-Guebaly, Toews, Lockyer, Armstrong, & Hodgins, 2000). The disease model of addictions, with its focus on tertiary treatment, is not seen by many in the field of medical education as an appropriate framework to promote early detection and intervention practices (Rowland & Maynard, 1989; Babor, 1990; Ockene, Wheeler, Adams, Hurley, & James, 1997). While the disease model has helped to legitimize alcoholism as a medical illness and reduce associated stigma for those with alcohol dependency, it does not extrapolate to a range of alcohol problems (Babor, 1990). For example, Farmer and Greenwood (2001) concluded that medical professional's pessimism about working with problem drinkers might result from a tendency to define treatment success only as long-term abstinence or cure. Total abstinence may be an appropriate goal for those with alcohol dependency; however, it is an extremely limited definition of success for less severe problem drinkers because cutting back on consumption may be sufficient to produce favourable outcomes. Other research suggests that medical professionals are reluctant to practice secondary prevention because of their tendency to generalize their past negative experiences with alcoholic patients to all patients with alcohol problems (Gopalan *et al.*, 1992; Geller *et al.*, 1989; El-Guebaly *et al.*, 2000). A related barrier is practitioners have stigmatizing beliefs about substance abusing patients and as a result fail to provide important alcohol intervention services (Rush, Bass, Stewart, McCracken, Labreque, & Bondy, 1994; Drummond, 1997; O'Connor & Schottenfeld, 1998; Freidman, McCullough, Chin, & Saitz, 2000; Farmer & Greenwood, 2001; Miller, Sheppard, Colenda, & Magen, 2001). Other reasons for medical professionals not practicing early identification and intervention include lack of time (Delbanco, 1992; Rush, Powell, Crowe, & Ellis, 1995), lack of instruction in medical curricula (Babor, 1990; Miller *et al.*, 2001), and non-supportive office systems (Durand, 1994).

Background

When physicians do use screening methods, they tend to avoid patient self-reports. Townes and Harkley (1994) found 76% of primary care physicians in their sample preferred to get information about patients' drinking from families, employers, or clinical laboratory tests, including blood alcohol, rather than from screening questionnaires. When general practitioners in Farmer and Greenwood's (2001) sample suspected problem drinking, the physicians screened with blood tests more often than with any other method.

Short of clear evidence of alcoholism, primary care physicians tend not to identify drinking problems that can be detected and intervened upon. Sdao-Javie, Berolzheimer, Rounds, & Janowsky (1993) concluded that medical professionals are reluctant to investigate substance abuse problems in the absence of obvious symptoms. They observed an increase in doctor's willingness to assess and diagnose substance abuse problems when they were presented with some indication of the existence of such a problem (i.e. a positive self-report screen score).

Brief interventions were designed to be delivered outside the specialty alcohol treatment system by various health and community care providers (Institute of Medicine, 1990); however, research suggests that medical care professionals do not view drinking problems as a distinct domain of practice appropriate to their own roles. Rather, in their view, drinking problems tend to adhere to the body of alcoholism, a specialist's domain, and the intervention practices that go with it (Farmer & Greenwood, 2001; Spandorfer *et al.*, 1999; Thom & Tellez, 1986). Spandorfer *et al.* (1999) found that the majority of physicians in this study preferred not to do the counselling of non-dependent problem drinkers themselves, but to refer those patients to a trained nurse. Farmer and Greenwood (2001) found that 56% of general practitioner respondents cited referral as their main role when dealing with patients with drinking problems. Ockene *et al.* (1997) concluded that the provision of ancillary staff to intervene with patients were important to compensate for the limitations on health care professional's time and practice resources.

This exploratory study examines practitioner-level predictors of using alcohol screening instruments/tests and managing patients at risk for drinking problems. The purpose of this study is to inform physician and nurse practitioner education to improve the practice of secondary prevention.

Method

This study was part of a larger project that tested a model of predictors of screening and brief intervention (SBI) in primary care settings (Gassman, 2003). In 1999, questionnaire data were collected from a random sample of licensed physicians (MDs) and nurse practitioners (NPs) in a northern California county. The names and addresses of state licensed health professionals were purchased from the California Office of Consumer Affairs. We limited the physician population to those who practiced through one of the regions several managed care organizations (MCOs). Recruitment materials mailed to 500 MDs and 300 NPs included an invitation to participate and a return postcard. Physicians and nurse practitioners who wished to participate received a questionnaire through the US mail. If the questionnaire was not returned within 2 weeks, participants received a telephone reminder and, if necessary, a follow-up mailing. The response rates for completed questionnaires were 28% for MDs and 59% for NPs. The low response rates limit our ability to generalize the findings, especially for MDs. This is often the case in studies using survey methods on physicians (Gottlieb, Mullen, & McAllister, 1987; Townes & Harkley, 1994; El-Guebaly *et al.*, 1995). We were not able to determine the characteristics of all non-respondents; however, 83 of them returned postcards indicating no time or interest to complete a questionnaire, and in addition, they responded to a few questions about their clinical practice. Those who agreed ($n = 330$) and those who wished not to participate ($n = 83$) did not differ significantly in number of hours of previous training in alcohol problems. Those who agreed to participate, however, perceived having a significantly higher percentage of patients with alcohol-related problems ($M = 15.3\%$, $SD = 17.6$) compared with those who chose not to participate ($M = 8.8\%$, $SD = 8.5$), $F(1, 339) = 7.9$, $p < 0.005$. Besides having less time and interest in completing a questionnaire, it seemed likely that those who did not participate were less aware of alcohol problems in their patients. To control for the effects of seeing patients with alcohol-related problems, responses to the

statement, 'Alcohol is a factor in most of the medical conditions I see' were included in all the tested models. Still, it remains important to consider this potential selection bias when interpreting the findings from this study.

Measures

The self-administered questionnaire was developed by the author through a series of focus groups in conjunction with a review of the literature. The instrument included 50-items on practitioners' beliefs and clinical practices regarding patients with alcohol problems and at-risk drinkers. The questionnaire was pilot tested on MDs and NPs. A prior study involved a factor analysis of belief items from this questionnaire, which yielded six belief barrier dimensions to SBI (Gassman, 2003). In the present study, individual belief items were selected based on direct reference to at-risk/problem drinkers or relevance to pre-existing research findings on barriers to secondary prevention. The questionnaire defined at-risk drinkers as people whose alcohol use was excessive enough to possibly lead to health problems (e.g. high blood pressure, accidents) or social problems (e.g. difficulties with work). Other items pertained to the provider's demographic characteristics, postgraduate alcohol education and knowledge about drinking guidelines.

Background variables—Profession was coded as a dummy variable (nurse practitioner = 1). One multiple-choice item asked, 'In total, how many hours of post-graduate training or continuing medical education (CME) on alcohol and alcohol related problems have you received?' The responses were coded as two binary variables (1–4h = 1, 4 h plus = 1) compared with none.

Objective knowledge—This was measured by a summated scale from 0 to 6 correct answers to six multiple-choice questions about the National Institutes of Health drinking guidelines. For example, one item asked what the US Government Dietary Guideline was for moderate drinking in terms of the maximum number of drinks per day for men. A second asked what the guideline was for women and a third asked about circumstances when a patient should abstain from alcohol.

Outcome variables—Three outcomes were measured by multiple-choice questions. The first item asked, 'In the past 12 months, how many times did you use a questionnaire, such as the CAGE, AUDIT or MAST, or some other formal screening instrument to assess a patient for alcohol problems?' The response options were never in the past 12 months, 1–2, 3–5, 6–11, 12–24, 25–49, 50 or more times, and not familiar with the questionnaires. The second item asked, 'In the past 12 months, how many times have you taken or requested a blood test (e.g. blood alcohol, MVC, GGT) for a patient because of concern about his or her alcohol consumption?' The response options were never in the past 12 months, 1–2, 3–5, 6–11, and 12 or more times. The final item asked, 'In the past 12 months, approximately how many patients have you managed for their heavy drinking or alcohol-related problems?' Response options were none, 1–5, 6–11, 12–24, 25–49, and 50 or more patients. After the data were collected the items were coded into three ordinal categories, 1 (never), 2 (1–11 times) and 3 (12 or more times) for the first two items, and 1 (none), 2 (1–11 patients) and 3 (12 or more patients) for the final item.

Predictor variables—The seven belief items in Tables III and IV measured beliefs toward problem drinkers, at-risk drinkers, or patients with alcohol-related problems. Response options consisted of a 5-point Likert scale ranging from 'strongly agree' to 'strongly disagree.' The responses to each belief statement were coded as two binary variables (strongly agree and agree = 1, neither agree nor disagree = 1) compared with strongly disagree and disagree.

Results

Sample characteristics

The background characteristics of the sample are described in Table I. The mean age for participants was 46 years for NPs and 49 years for MDs. Hours of postgraduate training or continuing medical education on alcohol and alcohol-related problems varied little between professions. Twenty-seven per cent of NPs and 20% of MDs reported no education of this type at all. The largest category represented 31% of NPs and 35% of MDs who reported less than 4 h of training. Participants represented a variety of primary fields of practice.

Chi-square analysis

We used Pearson chi-square tests to learn more about the two professions in relation to the outcomes. Table II compares the per cent of MDs and NPs that reported efforts to screen and manage alcohol problems in patients during the past year. Twenty-nine percent ($n = 77$) of respondents who were not familiar with screening questionnaires were counted with those who stated they never used such instruments. There was no significant difference between NPs and MDs in the number of times they reported use of a formal screening instrument to assess a patient for alcohol problems -both groups seldom did so. Compared with NPs, MDs reported they took or requested blood tests more frequently in the past year because of concern about a patient's alcohol consumption. Nurse practitioners reported the use of questionnaires and blood tests in about the same frequency; however, MDs displayed a clear preference for blood tests. Compared with NPs, MDs reported managing more patients for heavy drinking or alcohol-related problems.

Logit analysis

We first used separate multinomial logit analyses (STATA, version 8.2) to examine the relationship between profession, prior alcohol education, objective knowledge and fourteen belief variables with each of the reported screening and management outcomes (categories never or none, 1–11, 12 plus). Wald tests indicated that categories 1–11 and 12 or more may be combined without losing information. Accordingly, we used binomial logit to compare the outcome categories at least one versus never or none.

For a standard deviation increase in objective knowledge, the odds of using screening instruments versus never in the past increased by 46% (not shown). For agreement with not enough time to advise patients about drinking, the odds of reported use of screening instruments versus never in the past year increased 99% (not shown). In addition, for agreement with not knowing how to identify at-risk drinkers who have no obvious symptoms of excess consumption, the odds of using such instruments versus never in the past year decreased 61% (not shown). The logistic regression model that predicted use of screening instruments yielded a log likelihood equal to -142.0 , $p = 0.05$ (not shown).

Table III shows predictors of reported use of blood tests because of concern about a patient's alcohol consumption at least once versus never in the past year. The odds of using blood tests were 70% greater for MDs compared with NPs. In conjunction, for providers with 1–4 h and 4 or more hours of postgraduate alcohol education, the odds of administering blood tests increased 186 and 163%, respectively. When neutral with the statement, 'alcohol is a factor in most of the medical conditions I see,' the odds of using blood tests increased 190%. Furthermore, when in agreement that 'it is easy to generalize bad cases of alcoholism,' agreement and neutrality that problem drinkers are more likely to be non-compliant patients and neutral about not knowing how to identify at-risk drinkers, the odds of administering blood tests decreased 55, 59, 66 and 67%, respectively.

Table IV shows predictors of reported management of at least one heavy drinker or patient with alcohol-related problems versus none in the past year. The odds of reporting management of heavy or problem drinkers were 64% greater for MDs compared with NP's. For providers with 1–4 h of reported alcohol education, the odds of managing patients for alcohol problems increased 113%. When in agreement and neutral with the statement, 'alcohol is a factor in most of the medical conditions I see', the odds of managing patients with alcohol problems increased 323 and 169%, respectively. In conjunction, when in agreement and neutral with not knowing how to identify at-risk drinkers and neutral with not being aware of a single problem drinker who ever cut back upon medical advice, the odds of managing patients with alcohol problems decreased 75, 55 and 63%, respectively.

Discussion

This study aimed to identify practitioner level predictors of alcohol screening and management activities, and examine whether these suggest educational insights that might improve the practice of secondary prevention. In our sample, it appeared that prior alcohol education did not prepare health providers to detect early drinking problems; however, it did seem relevant to use of blood tests and management of heavy drinking-related problems. Alcohol education had no relationship to use of screening instruments and not knowing how to identify at-risk drinkers predicted failure to use screening questionnaires. In contrast, previous alcohol education predicted use of blood tests and management of patients for heavy drinking and related problems. Together, these findings suggest the education providers reported was applicable to known or suspected problem drinkers, rather than those at-risk or without observable symptoms.

Other findings concur with research showing use of blood tests when there is suspicion of a drinking problem (Farmer & Greenwood, 2001). In our sample, the absence of obvious symptoms of excessive drinking predicted failure to use blood tests. There is insufficient information in this study to understand why MDs were more likely than NPs to order blood tests and manage problem drinkers.

In addition to educational deficits, stigmatizing beliefs about alcoholics and problem drinkers (i.e. generalizations of alcoholism, drinkers are non-compliant) predicted failure to administer blood tests. Unfortunately, this finding indicated that stigmatization discouraged health providers from using blood tests even when awareness of a drinking problem exists.

Agreement that there was not enough time to advise patients predicted use of formal screening instruments, which seems counter-intuitive and begs an explanation. One possibility is that providers who practice under organizational policy to screen do so, despite strong feelings that there is no time to respond to the resulting information. This explanation was supported by a sub-analysis showing that, among providers who contract with managed care plans with formal policies on screening patients for alcohol problems, half reported use of a screening instrument at least once during the past year compared with only 27% who reported not having or being aware of such policies ($\chi^2 = 6.6, p = 0.01$).

The results suggest a selection bias for professionals with high caseloads of patients with alcohol problems. However, because the item, 'alcohol is a factor in most of the medical conditions I see', was included as a statistical control we are more confident the findings generalize beyond those providers aware their patients have alcohol related problems. In addition, this effect suggests that awareness of alcohol's role in many conditions seen in primary care settings is an important precursor to delivery of alcohol services.

Conclusion

The findings suggest the alcohol education that health care professionals receive is more conducive to treatment of chronic disease than to screening and early intervention for less severe drinking-related problems. Education and services for the management of addictions do not necessarily conflict with the promotion of secondary prevention practices; however, providing the former without comparable coverage and/or integration of the latter seemingly fails to challenge the deficits, and beliefs that discourage screening and early intervention.

It is the role of educators to help bridge understandings of addiction where specialists deliver behavioural treatment, with early detection and intervention procedures, which all health professionals are increasingly urged to use. Efforts to implement secondary prevention are in part re-educating processes, whereby health care professionals learn to view alcohol problems as more diverse than previously considered (Skinner, 1990). For instance, it is important that educational efforts expand practitioner awareness about alcohol as a factor in a variety of their patients' health conditions and encourage looking beyond the alcoholic stereotype to detect the more prevalent drinkers with less obvious signs of problem consumption. Instead of a primary or solitary focus on diagnostic procedures for alcohol or drug dependency, the findings support the need for a training emphasis on the use of screening questionnaires that require minutes to complete and can identify less severe cases. This study found that objective knowledge about the National Institutes of Health drinking guidelines predicted use of such instruments. While the earlier publication, *The Physician's Guide to Helping Patients with Alcohol Problems* (National Institute on Alcohol Abuse and Alcoholism, 1995) was the resource for drinking guidelines and screening procedures used in this study, the more recent publication *Helping Patients with Alcohol Problems: A Health Practitioner's Guide* (National Institute on Alcohol Abuse and Alcoholism, 2003) includes similar information yet addresses a wider audience of health care professionals.

Besides relevant training, formal policy that requires routine screening for alcohol problems may help providers to perform screening despite perceived time barriers to brief intervention. Other research has noted the importance of clinical practice standards and infrastructure support (McCrary, Richter, Morgan, Slade, & Pfeifer, 1996; Botelho & Richmond, 1996; Babor & Higgins-Biddle, 2000) in sustaining secondary prevention.

As mentioned previously, the generalizability of the findings is limited by the low response rates. It is probable that alcohol and drug issues were more important to the respondents than to those who did not respond. In addition, only physicians that worked in a clinical capacity with managed care organizations were included in the study, so the findings are not applicable to all primary care physicians.

Finally, the results demonstrate that neutral positions can be as important as polarized positions to predicting screening and management activities. Neutral response options in this study may have provided respondents with a more socially acceptable alternative to negative beliefs. It may be of interest to educators and researchers that professionals who endorse neutral positions toward problem drinkers may actually have stronger views, which they have chosen not to disclose, particularly in contexts that do not guarantee anonymity.

Acknowledgments

This study received support from the National Institute on Alcohol Abuse and Alcoholism (Grant No. R01 AA11713). Thanks to Dr Scott Long, at the Department of Sociology, Indiana University for assisting with the data analysis and to Eric Martin at the Indiana Prevention Resource Center for his editorial help. Thank you to all who participated in the study.

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Table I

Sample characteristics (%).

	Physicians (<i>n</i> = 136)	Nurse practitioners (<i>n</i> = 168)
Gender		
Male	74	4
Female	26	96
Race/ethnicity		
White	72	83
African-American	7	7
Asian	15	4
Hispanic	4	3
Other	2	3
Hours alcohol training		
None	20	27
<4 h	35	31
4–10 h	23	21
11–40 h	15	14
>40 h	7	7
Primary fields of profession ^a		
General/family medicine	12	25
Internal medicine	32	16
Obstetrics/gynecology	7	32
Paediatrics	18	12
Surgery	7	1
Emergency medicine	6	3
Anaesthesiology	2	0
Neurology	3	1
Radiology	1	0
Psychiatry	5	3
Other	21	38

^aPercentages do not total 100 because participants were instructed to mark all that apply.

Outcomes: health care professional reported efforts to detect or manage alcohol problems in patients in the past year.

Table II

Items	Never %	1-11 times %	12 or more times %	Pearson Chi-square signif.
No. of times a questionnaire or a formal screening instrument was used to assess an adult patient for alcohol problems.	MD 74.6	16.9	8.5	
	NP 66.9	18.6	14.5	
No. of times a blood test was taken or requested for a patient because of concern about his or her alcohol consumption.	MD 42.6	36.8	20.6	0.000
	NP 65.5	20.6	13.9	
No. of patients managed specifically for their heavy drinking or alcohol related problems.	None	1-11 patients	12 or more patients	
	MD 33.1	37.5	29.4	0.001
	NP 52.7	31.7	15.6	

Note: $n = 136$ physicians and $n = 167$ nurse practitioners.

Binomial logit coefficients for taking or requesting a blood test for a patient because of concern about his or her alcohol consumption at least one time versus never during the past year.

Table III

	Coefficient	SE.	% change in Odds	p
Profession (0 = MD, 1 = NP)	-1.20	0.31	-70.0	0.01
Hours of post-graduate training or CME on alcohol and related problems				
1=1-4 h	1.05	0.41	186.0	0.01
1=4 h plus	0.97	0.39	163.0	0.01
0-6	-0.08	0.13		
Objective Knowledge Scale				
1=Agree	0.31	0.37		
1=Neutral	-0.65	0.35		
1=Agree	-0.81	0.32	-55.0	0.01
1=Neutral	-0.27	0.39		
It is easy to generalize the really bad cases of alcoholism to all patients with alcohol-related problems				
1=Agree	-0.89	0.43	-59.0	0.05
1=Neutral	-1.08	0.53	-66.0	0.05
1=Agree	0.04	0.32		
1=Neutral	-0.07	0.40		
1=Agree	0.70	0.43	190.0	0.01
1=Neutral	1.06	0.39		
1=Agree	-0.63	0.34		
1=Neutral	-1.11	0.42	-67.0	0.01
I am not aware of a single problem drinker who ever cut back on his or her drinking upon medical advice	0.38	0.50		
1=Neutral	-0.44	0.42		

Log likelihood = -162.0, LR $\chi^2 = 80.75$, Pseudo $R^2 = 0.20$, $p = 0.00$.

Binomial logit coefficients for managing at least one patient for heavy drinking or alcohol-related problems versus none during the past year.

Table IV

	Coefficient	SE.	% change in Odds	p
Profession (0 = MD, 1 = NP)	-1.03	0.31	-64.0	0.01
Hours of post-graduate training or CME on alcohol and alcohol related problems				
1=1-4 h	0.75	0.38	113.0	0.05
1=4 h plus	0.05	0.37		
0-6	0.07	0.13		
Objective Knowledge Scale				
1=Agree	0.10	0.37		
1=Neutral	-0.14	0.33		
1=Agree	-0.12	0.31		
1=Neutral	-0.58	0.39		
1=Agree	0.11	0.42		
1=Neutral	-0.08	0.51		
1=Agree	0.24	0.32		
1=Neutral	-0.12	0.38		
1=Agree	1.44	0.48	323.0	0.01
1=Neutral	0.99	0.40	169.0	0.01
1=Agree	-1.37	0.34	-75.0	0.01
1=Neutral	-0.79	0.40	-55.0	0.05
1=Agree	0.61	0.50		
1=Neutral	-1.00	0.42	-63.0	0.01

Log likelihood = -165.0, LR $\chi^2 = 75.0$, Pseudo $R^2 = 0.18$, $p = 0.00$.