Anxiety Disorders and Cardiovascular Disease Determinants in a Population Sample

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Citation

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Abstract

Objective: Epidemiological research can assist with clinical practice and service planning, and can also help to generate hypotheses about disease etiology. The objective of this epidemiological study was to facilitate these goals by determining the distribution of anxiety disorders in sub-regions within a larger health region and a set of disease risk factors.

Methods: Sampling and data collection occurred by telephone in a Canadian health region in Alberta of approximately one million people. The telephone survey included 6,578 participants and covered 3 anxiety disorders: panic disorder, generalized anxiety disorder, and social phobia.

Results: Regional prevalence differences were not identified. However, associations between anxiety disorders and excessive alcohol consumption, smoking, obesity, hypertension, and elevated cholesterol were found.

Conclusions: Integration of mental health services with other health promotion and prevention activities may be an efficient strategy for clinical practice and public health. A better understanding of the connections between anxiety disorders and chronic disease risk factors should be a goal of future research.

INTRODUCTION

Large scale epidemiological studies have confirmed that anxiety disorders are highly prevalent in the population. The 2003 Canadian Study of Mental Health and Wellbeing (CCHS 1.2) ([1]) estimated the 12-month prevalence of panic disorder at 1.6%, agoraphobia at 0.7%, and social phobia at 3.0% (http://www.statcan.ca/Daily/English/030903/d030903a.htm). Cairney et al. recently evaluated the CCHS 1.2 prevalence of social phobia in older adults (55 plus) in Canada, and reported 12-month prevalence at 1.3% in this group ([2]). The pan-European ESEMeD study included a more inclusive set of anxiety disorder diagnoses and reported an overall lifetime prevalence of any anxiety disorder at 13.6% ([3]). The ESEMeD investigators estimated that in any one year 6.4% of the European population will meet DSM-IV ([4]) criteria for one or more anxiety disorders. Lifetime prevalence for panic disorder, agoraphobia, and social phobia were 2.1%, 0.9%, and 2.4%, respectively. Generalized anxiety disorder had a 2.8% lifetime prevalence. This estimate of generalized anxiety disorder prevalence is lower than most North American estimates, which have generally been in the range of 5% ([5]).

The significance of anxiety disorders for overall health spans biological, psychological, and social domains. Anxiety disorders have been associated with hypertension and smoking ([6],[7]), coronary heart disease ([8]), nicotine dependence, and drug and alcohol-use disorders ([9]).

The National Comorbidity Survey Replication (NCS-R) in the US included the Sheehan Disability Scale, and found that more than half of those with panic disorder reported severe impairment on the scale ([10]). Also, according to the Global Burden of Disease Study, panic disorder was ranked 11th as a cause of years lived with disability in the 15-44 year age group, and accounted for 2.2% of disability in this age group (http://www.who.int/whr/2001/chapter2/en/index3.html). The importance of anxiety disorders for public health therefore involves concern in both mental and physical health domains.

Descriptive epidemiological data can assist with formulating

a response to these challenges. Understanding the geographical distribution of anxiety disorders can help with planning the physical location of services. Understanding the distribution of anxiety disorders in relation to other important risk factors can help clarify the significance of these conditions for preventive initiatives. Traditionally, descriptive epidemiology examines the distribution of disease in relation to time, place, and person. As most anxiety disorders are endemic conditions, variations in relation to time are not the most important issues. Variations in relation to geographical location, however, may have important implications for planning services (e.g. locating services in high prevalence areas might improve access to treatment), as may the personal characteristics of afflicted individuals. Most available epidemiological data, however, derive from large, epidemiological projects, often with a national scope. These results may have limited relevance of planning services in a localized area. Here, we describe an investigation of anxiety disorder prevalence in the localized setting of a single health region. The project was driven by a need for local data, but the results may have broad applicability to planning services for these disorders.

METHODS

Data used in the analysis were collected during a survey initiative called the Calgary Health Region Population Survey (CHRPS). In the Canadian province where the study was conducted there is universal-coverage and a publicly administered health care system, but much of the responsibility for needs assessment, service planning, and service provision and evaluation have been divested by the provincial government to a set of nine health regions located in the province. The Calgary Health Region is one of these. Data collection was carried out by a regional telephone survey unit in the Health Region's Quality, Safety, and Health Information Unit. De-identified data were released to the investigators for analysis after approval for a secondary data analysis was obtained from the University of Calgary Ethics Review Board.

As a goal of the CHRPS study was to assist with planning regional services, the survey methodology used a set of sub-regional boundaries that are employed for planning and administration of services within the health region. The sub-regional boundaries were developed by the region using a collaborative process that involved consultation and cooperation with the municipal government, Boards of Education, the United Way, and the provincial ministry of health. The basic geographical unit for assembly of these sub-regions (which the Region also calls “social districts”) were neighborhood boundaries. Census Tracts (CT) were a secondary geographical unit. The Calgary Health Region includes the City of Calgary (population approximately one million) and also predominantly rural areas stretching west and south to the British Columbia border. Within the city, an attempt was made to maintain homogeneity of socioeconomic status by considering CT median household income, while at the same time respecting significant natural features such as major roads and rivers and neighborhood affiliations (e.g., community associations that share resources and operate joint programs). In the rural areas, the sub-regions coincided with planning areas used by the Health Region's rural programs. In total, there were 19 sub-regions

The sampling began with a randomly selected sample of residential telephone numbers drawn from a proprietary database of listed telephone numbers. The final digit in each selected number was then substituted with a random integer in order to ensure an approximately equal probability of reaching listed and unlisted numbers. Quota sampling was used to ensure selection of an approximately equal proportion of men and women in each sub-region. In other words, after households were contacted, interviews were conducted until the number of women interviewed was equal to 50% of the planned sample size for the sub-region. After this, men within the contacted household were selectively interviewed. In order to be considered eligible for the CHRPS survey, participants had to provide verbal consent to be interviewed, be able to speak English, and be between the ages of 18 and 64 years of age. The telephone interviews were conducted by experienced interviewers using computer assisted telephone interviewing software. Households were called up to 9 times in an attempt to complete an interview.

Sampling weights were calculated to adjust for different probabilities of selection in the various sub-regions. These weights were calculated as the inverse of the estimated selection probability for each participant according to their sub-region, age, and sex. The selection probability was estimated by dividing the number of participants in each possible age, sex, and sub-regional group, and dividing this number by the number within that stratum in census data. The analysis used the survey (“svy”) commands in Stata, with the sub-regions being treated as sampling strata, and employed the sampling weights. Three survey commands were used: for means (svy: mean), tables (svy: tab), and logistic regression (svy: logistic). Confidence intervals for

odds ratios from these logistic regression models are reported, as are design-based F-tests to evaluate the statistical significance of differences between groups. In the assessment of regional prevalence differences, likelihood ratio tests were also used. Since this was not possible with survey logistic regression commands, unweighted logistic regression models were used as a basis for these tests. The analysis was carried out using Stata 9.1 (Stata Corporation, College Station, Texas).

A series of modules from the Mini Neuropsychiatric Diagnostic Interview (MINI) ([11,12]) were included in the survey interview to assess three anxiety disorders: panic disorder, generalized anxiety disorder, and social phobia. Another anxiety disorder, agoraphobia, is also assessed by the MINI, but the assessment is made based only on two items. For this reason, agoraphobia was not used as an anxiety disorder diagnosis in this analysis. The version of the MINI used, the "MINI-Plus" produces DSM-IV diagnoses. The MINI was chosen because it is sufficiently brief that it could be included in the CHRPS survey. It would not have been possible to include more detailed interviews such as the Composite International Diagnostic Interview ([13]). However, the MINI was developed as a screen for use in primary care, and therefore places more emphasis on sensitivity than on specificity. In order to guard against false positive results, an indicator of clinical significance was added to the interview. Anxiety syndromes identified by the MINI were regarded as representing clinically significant conditions if participants reported that their anxiety symptoms interfered "a lot" with their life. The MINI evaluates symptoms in different time frames depending on the condition in question. For generalized anxiety disorder, the questions refer to the past 6-months, and for panic disorder and for social phobia to the past month.

Additional CHRPS content included items assessing alcohol consumption, smoking, and self-reported professionally diagnosed hypertension (high blood pressure) or elevated cholesterol. For example, the item for high blood pressure was: "Have you ever been told by a doctor, nurse or other health professional that you have high blood pressure." Self-report data on height and weight were also collected, allowing the body mass index (BMI) of survey respondents to be estimated. Finally, items asking about receipt of pharmacological, cognitive, and behavioral treatments were included.

RESULTS

A total of 30,004 numbers were called between the dates of March 29, 2005 and April 1, 2006. Of these, it was possible to confirm that 20,052 calls reached residential households, the remainder consisting of fax machines, unanswered ringing, busy signals, out of service messages and so on. There were 6,831 refusals at the household level and 579 refusals from individual respondents. Also, 6,064 individuals were excluded for reasons of eligibility or quota sampling needs. In total, 6,578 individuals were interviewed. The sample included 3,092 men and 3,486 women, indicating that the quota sampling was largely, but not completely effective at reproducing the population sex distribution. Within the age-range studied, this is nearly 50:50 in Calgary region. The age and sex distribution of the sample is depicted in Figure 1. Since the goal was selection of one respondent from each household, the response rate could be calculated most conservatively as 6,578 completed interviews divided by number of households that contained an identifiable eligible respondent (20,052 – 6,064 = 13,988), leading to a response rate of 47% (6,578/13,988). The response rate among selected individuals, however, was higher since of those identified as eligible within households (n = 7,157), only 579 refused – an 8% individual refusal rate. Non-response at the individual level is probably more likely to be related to mental health, and is therefore of more concern as a source of bias than household non-response.

Figures 1 and 2 present the age distribution of the population and of the unweighted sample. Weighted estimates are not shown since these are identical to the population proportions. For both men and women, there was a tendency for older age groups to be relatively over-represented.

Figure 1

Figure 1: Age and Sex Distribution of the Population and the Unweighted Sample: Men

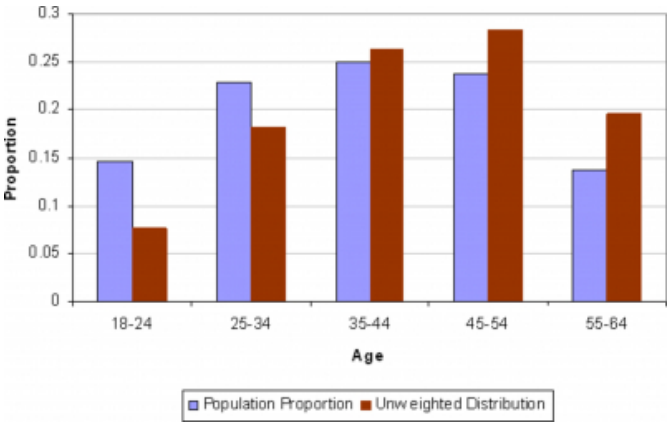
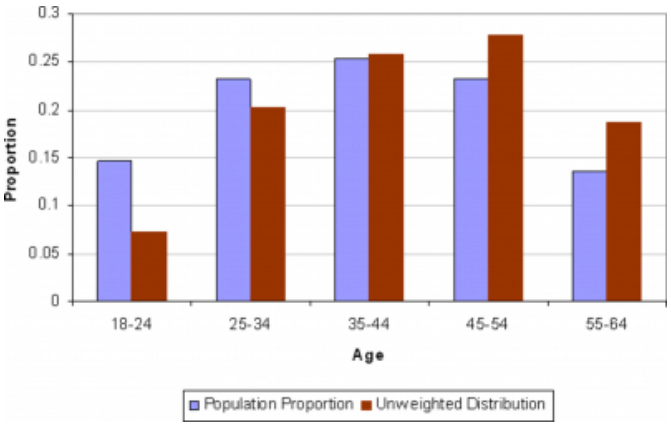


Figure 2

Figure 2: Age and Sex Distribution of the Population and the Unweighted Sample: Women



The weighted prevalence of panic disorder was 2.5% (95% CI: 2.1 – 2.9). For generalized anxiety disorder, the weighted prevalence was 3.8% (95% CI: 3.3 – 4.3), and for social phobia the weighted prevalence was 1.6% (95% CI: 1.2 – 1.9). As expected, the prevalence of these disorders was higher in women than in men (see Table 1). However, the sex difference for social phobia prevalence did not attain statistical significance. There was no difference in prevalence across age groups for panic disorder, design-based F (3.6, 23495) = 0.52, p = 0.70, generalized anxiety disorder, design-based F (3.5, 23235) = 0.48, p = 0.72, nor social phobia, design-based F (3.6, 23723) = 1.9, p = 0.12. According to the MINI, 4.0% (95% CI: 3.4 – 4.5) of the population had one or more of the three anxiety disorders assessed at the time of the survey.

Figure 3

Table 1: Age and Sex Specific Prevalence of Anxiety Disorders.

	Panic Disorder	Generalized Anxiety Disorder	Social Phobia
	% (n)	% (n)	% (n)
Men	1.7% (52/3,092)	2.5% (79/3092)	1.3% (39/3092)
Women	3.4%* (120/3,486)	5.1%** (175/3486)	1.8% (59/3486)
Age 18-24	2.4% (13/490)	3.9% (20/490)	1.8% (9/490)
Age 25-34	2.6% (32/1,268)	4.1% (52/1,268)	2.2% (28/1,268)
Age 35-44	2.1% (40/1,715)	3.4% (61/1,715)	1.4% (25/1,715)
Age 45-54	3.0% (54/1,846)	4.2% (78/1,846)	1.5% (26/1,846)
Age 55-64	2.5% (33/1,259)	3.2% (43/1,259)	0.7% (10/1,259)

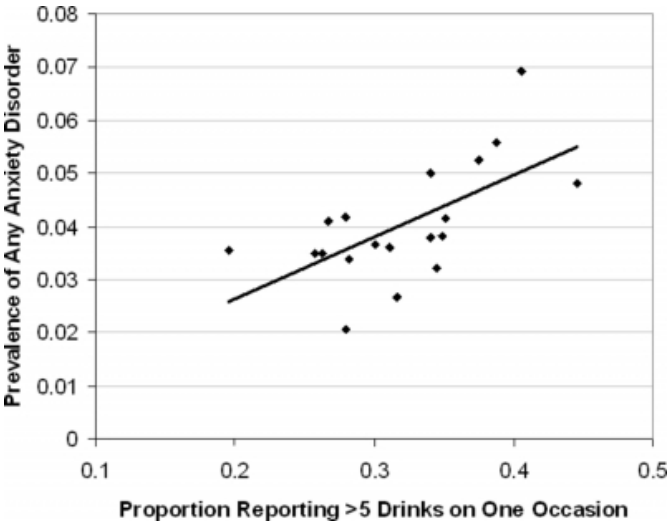
* prevalence significantly higher in women, design-based F(1, 6559)=16.5, p<0.001
** prevalence significantly higher in women, design-based F (1, 6559) = 19.4, p < 0.001

Logistic regression was used to further evaluate the demographic pattern. For panic disorder, age group by sex interactions were not significant, nor were the effects of age group alone. However, the effect of sex was significant, with a higher prevalence being seen in women (OR = 2.1, 95% CI: 1.5 – 3.0). A similar result was found for generalized anxiety disorder, with a higher prevalence in women (OR = 2.1, 95% CI: 1.5 – 2.8). For social phobia, there were also no age by sex interactions, but consistent with Table 1, there was no effect of sex (OR = 1.4, 95% CI: 0.9 – 2.1) nor of age group (design-based F (3.55, 23272) = 1.9, p = 0.12). Unweighted logistic regression was used to test for sub-regional differences in disorder prevalence for each disorder using a likelihood ratio test. The test was based on use of 18 indicator variables representing the 19 sub-regions. The procedure was also carried out for a category consisting of respondents with any one or more of these disorders. No significant differences across sub-regions were found.

There was an association between participants reporting that they sometimes drank 5+ alcoholic beverages per day (heavy drinking) and anxiety disorders: OR = 1.4, 95% CI 1.0 – 2.0, F (1, 4793) = 4.36, p = 0.04. In addition, the frequency of heavy drinking was seen to be higher in men than women (45% versus 25%, design-based F(1, 4793) = 160.17, p < 0.001. There was no evidence of alcohol by sex interactions in any of these analyses. A higher rate of heavy drinking in men could confound the association of heavy drinking with anxiety disorders. For this reason, the estimate of association was adjusted using logistic regression models that included sex as a covariate (after confirmation that no interactions were present). The adjusted odds ratio for panic disorder was 1.6 (95% CI: 0.98 – 2.5), for generalized anxiety disorder it was 2.0 (95% CI: 1.1 – 3.4), and for social phobia it was 1.8 (95% CI: 1.2 – 2.5). When the group reporting heavy drinking was evaluated in a logistic regression model of this type, the odds ratio for any anxiety disorder was 1.7 (95% CI: 1.2 – 2.5). The association was also seen ecologically. Sub-regions with higher rates of heavy drinking tended to have higher frequencies of anxiety disorders. Figure 3 shows the correlation between unweighted anxiety disorder prevalence (any disorder) and the frequency of heavy drinking in the 19 sub-regions.

Figure 4

Figure 3: Ecological Analysis: Heavy Drinking and Anxiety Disorder Prevalence

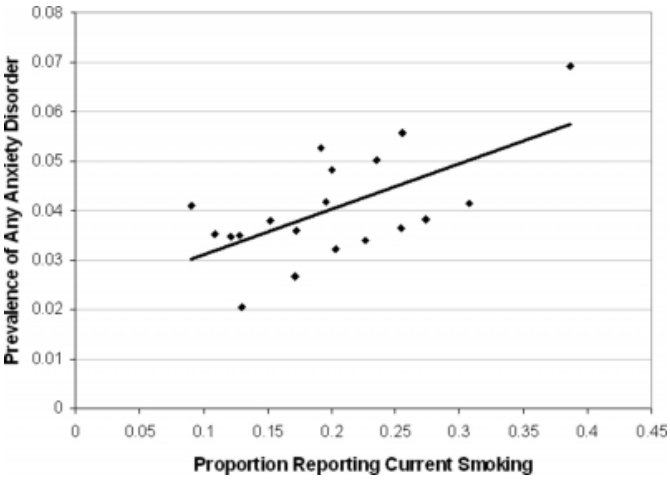


An association between smoking status and anxiety disorder prevalence was also observed. Current smoking status was significantly associated with panic disorder, OR 2.1 (95% CI: 1.5 – 3.0), generalized anxiety disorder, OR 2.0 (95% CI: 1.5 – 2.7), and social phobia, OR = 2.3 (95% CI: 1.5 – 3.6). No interactions between sex and smoking were found. The odds ratio for any anxiety disorder in participants who were current smokers, adjusted for sex using logistic regression, was 2.1 (95% CI: 1.6 – 2.8). The association between anxiety disorder prevalence and current smoking status and obesity were also seen in an ecological analysis. The smoking data are presented in Figure 4: sub-regions with a higher unweighted prevalence of smoking tended to have higher anxiety disorder prevalence. Significant associations were observed between each of the anxiety disorders and obesity (defined here as BMI ≥ 30). The OR for any anxiety disorder in subjects with obesity was 1.7 (95% CI 1.2 – 2.2). Hypertension was associated with each anxiety disorder except for social phobia. A sex adjusted OR for hypertension in participants with any anxiety disorder was 1.8 (95% CI: 1.3 – 2.4). The same pattern was seen for professionally diagnosed “high cholesterol,” with a sex adjusted OR of 1.4 (95% CI: 1.0 – 1.9).

Among individuals with one or more of the specified anxiety disorders, the prevalence of the various cardiovascular risk factors was elevated by a considerable extent. Whereas the prevalence of smoking in those without anxiety disorders was 19.6% (95% CI: 18.5 – 20.7), it was higher at 33.5% in those with one or more of the evaluated anxiety disorders (95% CI: 27.3 – 39.7) and was statistically significant (design-based F (1, 6549) = 24.4, p < 0.001). In those without an anxiety disorder, the prevalence of obesity was 16.9% (95% CI: 15.9 – 17.9), as compared to 25.3% (95% CI: 20.0 – 30.6) in those with an anxiety disorder and was statistically significant (design-based F (1, 6559) = 11.96, p = 0.001). Hypertension was reported by 16.1% (95% CI: 15.2 – 17.1) of the general population, as compared to 25.7% (95% CI: 20.1 – 31.3) of those with one or more of the three evaluated anxiety disorders and was also statistically significant (design-based F (1, 6559) = 13.49, p < 0.001). However, for those without anxiety disorders, the prevalence of elevated cholesterol was reported by 26.7% (95% CI: 25.3 – 28.1), and not significantly different from that of respondents with anxiety disorders (33.1%, 95% CI 26.1 – 40.2), design-based F (1, 4660) = 3.6, p = 0.06).

Figure 5

Figure 4: Ecological Analysis: Current Smoking and Anxiety Disorder Prevalence



Overall, 48% of subjects with an anxiety disorder reported taking an antidepressant during the past year. A likelihood ratio test from an unweighted logistic regression model predicting antidepressant was not significant for sub-regional differences (χ^2 = 13.5, df = 18, p = 0.76). A test for differences in anxiolytic use was similarly non-significant (χ^2 = 15.2, df = 18, p = 0.65). Overall, 30% of subjects with an anxiety disorder reported taking an anti-anxiety medication. Participation in psychotherapy was less frequent than pharmacotherapy. Eighteen percent of participants reported spending at least six sessions in psychotherapy, which included relaxation techniques and/or thought modification.

DISCUSSION

The CHRPS survey assesses health indicators in 19 sub-regions within the Calgary health region. While the CHRPS survey is a survey of a geographically defined health region,

the results presented here may be relevant to other populations and the health systems serving them. The data summarized in this report were concerned with three common anxiety disorders. No regional differences either in anxiety disorder prevalence or treatment receipt were identified. As such, the survey results do not provide any specific guidance concerning the geographical location of services. The lack of differences in treatment provision across sub-regions also did not identify specific geographical areas where access to treatment needs to be improved. These may, of course, exist, but the sub-regional analysis reported here did not identify them.

Nevertheless, these results have important implications for delivery of care and planning of services. Associations were found between anxiety disorders and a variety of important cardiovascular risk factors: current smoking, excess alcohol consumption, obesity, hypertension, and high cholesterol. The association with smoking was an expected one, as associations between various anxiety disorders and smoking have been previously reported ([6,7,14]). The association of generalized anxiety disorder with professionally diagnosed hypertension was also reported previously by Barger ([6]). However, an association with obesity has not previously been identified ([15]).

One of the most interesting results is the clustering of anxiety disorders with other factors that are targets of public health action – alcohol consumption and cardiovascular risk factors. These associations were present at the individual level, but also at the sub-regional level, such that regions with more anxiety disorders tended to have more obesity, smoking, excessive alcohol consumption, hypertension, and high cholesterol. This finding may have significance for the targeting of resources since it may mean that interventions for anxiety disorders can efficiently be packaged along with certain other public health activities. It also raises the concern that anxiety disorders could be a barrier towards preventive and health promotion activities. Although individuals with anxiety disorders more often had risk factors, their anxiety could theoretically act as a barrier towards participation in preventive and health promotion activities.

Telephone surveys are vulnerable to bias due to non-response. While it seems plausible that individuals with anxiety disorders may be likely to participate in such surveys, this would only introduce bias into the regional comparisons if the effect of anxiety disorders on participation differed by sub-region. The association between anxiety disorders and smoking, obesity, and diagnoses related to cardiac risk would only be due to selection bias in the event that anxiety disorders affected prevalence in a way that differed across these variables. Also, the MINI is a brief interview that is probably less accurate than more detailed psychiatric diagnostic interview. Non differential misclassification of anxiety disorder status might have caused bias towards the null in the sub-regional comparisons.

The prevalence estimates from this survey are comparable with recent studies published elsewhere. The 12-month period prevalence of panic disorder prevalence in the National Comorbidity Survey replication was 4.8% ([10]). A recent review placed the annual prevalence of generalized anxiety disorder at approximately 3-5% ([16]). A review of social phobia prevalence placed the median 12-month estimate at 2.0% ([17]). As noted above, a recent study of older adults (55+) in Canada placed the 12-month prevalence of social phobia at 1.3% ([2]).

The data presented here are cross-sectional and cannot elucidate causal connections between anxiety disorders, alcohol consumption, and cardiovascular risk factors. The associations may be due to an effect of anxiety disorders on alcohol consumption and cardiovascular risk factors or an effect of the latter variables on the former. Alternatively, the associations may be due to shared risk factors or interactions involving prognosis or mortality.

CONCLUSION

While there is an extensive literature concerned with associations between cardiovascular and mood disorders, anxiety disorders have received less attention in research. The results presented here suggest that anxiety disorders are closely related to a variety of other important health determinants including alcohol consumption, smoking, obesity, hypertension, and high cholesterol. This may be important for planning health care services, and some of the associations may also reflect etiological connections. Additional research is needed to further clarify these associations and to understand their importance for etiology and care delivery.

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