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Clustering of psychiatric and somatic illnesses in the general population: multimorbidity and socioeconomic correlates

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Abstract

The distribution of psychiatric disorders and of chronic medical illnesses was studied in a population-based sample to determine whether these conditions co-occur in the same individual. A representative sample (N = 1464) of adults living in households was assessed by the Composite International Diagnostic Interview, version 1.1, as part of the São Paulo Epidemiologic Catchment Area Study. The association of sociodemographic variables and psychological symptoms regarding medical illness multimorbidity (8 lifetime somatic conditions) and psychiatric multimorbidity (15 lifetime psychiatric disorders) was determined by negative binomial regression. A total of 1785 chronic medical conditions and 1163 psychiatric conditions were detected in the population concentrated in 34.1 and 20% of respondents, respectively. Subjects reporting more psychiatric disorders had more medical illnesses. Characteristics such as age range (35-59 years, risk ratio (RR) = 1.3, and more than 60 years, RR = 1.7), being separated (RR = 1.2), being a student (protective effect, RR = 0.7), being of low educational level (RR = 1.2) and being psychologically distressed (RR = 1.1) were determinants of medical conditions. Age (35-59 years, RR = 1.2, and more than 60 years, RR = 0.5), being retired (RR = 2.5), and being psychologically distressed (females, RR = 1.5, and males, RR = 1.4) were determinants of psychiatric disorders. In conclusion, psychological distress and some sociodemographic features such as age, marital status, occupational status, educational level, and gender are associated with psychiatric and medical multimorbidity. The distribution of both types of morbidity suggests the need of integrating mental health into general clinical settings.

Key words: Comorbidity; Multimorbidity coefficient; Negative binomial regression; Common psychological symptoms; Socioeconomic status; Chronic medical illness

Introduction

Emphasis on somatic morbidities is the focus of Millennium Development Goals (1) and supports the view that mental health has little relevance to the world's development agenda, despite the evidence that mental disorders are amongst the most important causes of disability, poor quality of life, and premature death in some age groups. However, the co-occurrence of medical and psychiatric morbidity is a well-known phenomenon observed among most of health service attendees (2-4). In addition to causing distress, functional disability, burdens, and stigmas, mental illness is closely associated with some socioeconomic determinants such as poverty, gender disadvantage, and with poor physical health, notably HIV/AIDS, and poor maternal and newborn health (1). Therefore, the comorbidity of psychiatric and somatic conditions is even more relevant to developing countries, where there are insufficient primary care units and well-trained personnel in most deprived areas, obstructing equitable access to health care facilities by the poor population.

Episodes of ill-health seem to be unevenly distributed among populations and some individuals might experience more disorders than others. When disorders occur in combination more often than expected, one of two processes might be operative involving shared risk factors, or, one disorder may possibly act as a risk factor for another (5). The term multimorbidity rather than comorbidity has been

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proposed in the epidemiology of chronic disease to refer to the co-occurrence of two, but often more than two, medical conditions in the same person (6). An explanation for the co-occurrence of psychiatric and chronic medical conditions is that disorders tend to concentrate in individuals according to a morbidity-dependent mechanism, whereby psychiatric and physical morbidities are possibly associated in a self-perpetuating and mutually reinforcing causality (7). In the psychiatric literature, a recent example is represented by the data from the US National Comorbidity Survey Replication (NCS-R), in which over 6% of respondents reported a 12-month history of three or more different psychiatric disorders (8), most of them of serious or moderate severity.

Scarcely studied by public health researchers, information on the pattern of distribution of psychiatric and chronic medical morbidities in the general population remains unknown in developing countries. In the present paper, we consider the empirical evidence linking psychiatric to chronic medical morbidities based on the co-occurrence of both types of morbidities in a population-based sample in a city in Southern Brazil (9). We propose a number of characteristics that, according to the literature, might be risk factors for psychiatric and chronic medical illnesses (6). Using lifetime prevalence data, we examined whether the tendency of medical illnesses and psychiatric disorders to co-occur differs between specific diagnoses. In addition, we investigated sociodemographic determinants of medical and psychiatric multimorbidity.

Subjects and Methods

The São Paulo Epidemiologic Catchment Area Study is a household survey conducted in the city of São Paulo, located in Southeast Brazil. The population of this study was drawn from two boroughs in the catchment area of the University of São Paulo's Medical Center, in order to plan health service delivery (10). At the time of the 1991 Census (11), this region contained 28,169 households with 91,276 inhabitants. The area consists predominantly of families of middle and upper socioeconomic level, although it does also contain some shantytowns ("favelas" and "cortiços").

The study used an area probability design with age stratification and multiple respondents per household. Eligible respondents were non-institutionalized adults aged 18 years or older. The stratification rule included an oversampling of persons aged 18-24 years and 60 years or older. Of the remaining individuals aged 25-59 years living in the selected household, only one was chosen randomly for an interview on the basis of Kish' selection table (12). Based on these three age strata, the final sample consisted of 1464 subjects, with an individual response rate of 76.8%. Face-to-face interviews were conducted with all respondents in their household between 1994 and 1995 after they gave written informed consent. Additional details of this survey have been described elsewhere (9).

The diagnostic instrument used was the Brazilian version of the Composite International Diagnostic Interview (CIDI), version 1.1 (13), a structured instrument designed for lay interviewers (14), providing prevalence estimates for ICD-10 diagnoses (15). All interviewers participated in a 7-day study-specific training program provided by the CIDI training center in São Paulo for the use of the instrument.

Bearing in mind the chronic and relapsing nature of most psychiatric morbidities, lifetime non-affective psychosis, panic attack, generalized anxiety disorder, any phobias (included simple phobia, agoraphobia, and social phobia), obsessive-compulsive disorder, depression, dysthymia, bipolar disorder, bulimia, alcohol use disorder, substance use disorder, nicotine dependence, somatoform disorder, dissociative disorder, and current cognitive impairment represented the psychiatric conditions considered. Due to the low number of subjects reaching case threshold for panic disorder (N = 23), we considered a broader concept of severe, unexplained panic attacks by removing the frequency criteria, thus extending the category of the panic attacks to 48 subjects (16,17).

An indicator of psychological distress or negative affectivity (18,19) was created from nine disaggregated CIDI 1.1 questions about common psychological symptoms. The underlying rationale was to allow the detection of subthreshold levels of distress associated with physical morbidity and overall multimorbidity (5,6,20) by creating a continuous measure of the presence of symptoms with hierarchical-free rules. The following symptoms were considered for this score: worrying, feeling of anxiety, muscle tension, restlessness, irritability, depressed mood, feeling worthless, feeling overwhelmed by everyday tasks, and loss of interest, according to the following CIDI questions: I. "Have you ever had a period of 1 month or more when most of the time you felt tense, worried, and anxious?"; II. "When you were worried and anxious, were you also bothered by tense, sore or aching muscles?"; III. "When you were worried and anxious, were you also restless?"; IV. "Have you ever had 2 weeks or more when nearly every day you felt sad, blue, depressed?"; V. "When you were worried and anxious, were you also keyed up or on edge?"; VI. "When you were worried and anxious, were you also particularly irritable?"; VII. "Have there ever been 2 weeks or more when nearly every day you felt worthless?"; VIII. "Did you often feel that you could not cope with your everyday life and responsibilities?"; IX. "Have there ever been 2 weeks or longer when you lost interest in most things like work or hobbies or things you usually liked to do for fun?". This "psychological distress" score is the sum of all the above symptoms reported, coded as dummy variables. The possible score range is 0 to 9. For the sample, the median value was 1.0 and the Cronbach's alpha coefficient of internal consistency was 0.7.

Eight chronic and burdensome medical illnesses were considered in the analyses. Participants were asked about their lifetime experience of six selected chronic medical conditions: high blood pressure, asthma, heart disease,

diabetes, stroke, and/or cancer. The questions: “Have you ever had...” or “Has a doctor ever told you that you have...” were asked for high blood pressure, diabetes, stroke, and/or cancer. Heart disease was defined as a self-reported medical diagnosis of any cardiac disease and/or a positive answer to the WHO-Rose Angina Questionnaire (21). Asthma was defined as the presence of recurrent bronchospasm and/or wheezing. Two additional questions about “headache” and “low back pain” were assessed based on questions from the somatoform disorder’s section of the CIDI. Positive answers to the questions “Have you ever had a lot of problems with back pain?” and “Have you ever had a lot of problems with headaches?” were considered to be the presence of the symptom when the probe questions revealed that the symptoms were due to a physical illness.

Data analysis

Data were analyzed statistically using the SAS package version 8 (22). First, we used the multimorbidity coefficient to capture simultaneously the association between the 8 medical and 15 psychiatric disorders, expressed as the ratio between observed and expected numbers of persons with a given number of disorders. When disorders are randomly distributed (i.e., neither type causes the other nor do they share risk factors), the Poisson distribution gives the expected number of persons. However, when disorders cluster in individuals, their distribution is a negative binomial, and more individuals than expected under the Poisson assumption of independence have multiple morbidities. In this situation, multimorbidity coefficients are larger than unity. Likelihood ratio (LR) tests were used to examine departure of psychiatric and medical disorders from Poisson distribution. The clustering pattern was also inspected graphically.

Because there was strong evidence of multimorbidity in the study sample, negative binomial regression was chosen to examine variables associated with this phenomenon. This approach is comparable to Poisson regression, but is more appropriate with nonrandomly distributed outcomes. It yields relative risk ratios (RR) comparing numbers of disorders between different groups of subjects according to their degree of exposure to the risk factor in question. We calculated RR for each of the 8 medical and 15 psychiatric conditions, to indicate how much the presence of each condition increased the number of either somatic or psychiatric disorders.

The negative binomial regression model was used to explore the relationships of socio-demographic correlates of multimorbidity. RRs were calculated for each independent predictor, separately for somatic and psychiatric conditions. We considered the following independent predictors: age group, marital status, years of education, employment status, annual family income (in US dollars), social class, and the psychological distress score. The psychological distress score entered the model as a numerical variable. Two final negative binomial regression models were reached to detect the determinants of multimorbidity, one for the psychiatric conditions and the other for the medical conditions, by the stepwise backward method.

Since the collected data were obtained from a complex stratified sample design, data were weighted to adjust for differential probabilities of selection and non-response. Standard errors of prevalence estimates and the 95% confidence interval (95%CI) for RR were computed using the method of Jackknife repeated replications to adjust for the design effects introduced by clustering and weighting of observations (12). All evaluations were based on two-sided tests at the 0.05 level of significance.

Results

Overall, 1785 chronic medical illnesses, 1287 (72.1%) of them being comorbid with concurrent medical conditions, were detected in 34.1% of the respondents, and a total of 1163 psychiatric disorders were reported, 794 (68.3%) of them being comorbid with another psychiatric disorder and detected in 20% of the sample.

Table 1 shows the observed and expected multimorbidity for medical and psychiatric conditions, with their respective multimorbidity coefficient. Multimorbidity occurred more frequently than expected mainly for the psychiatric

Table 1. Multimorbidity distribution of 1163 psychiatric conditions (15 types) and 1785 chronic medical conditions (8 types) in a general population sample from the Epidemiologic Catchment Area Study of São Paulo (ECA-SP) (N = 1464).

Multimorbidity	Observed (N)	Expected (N)	Multimorbidity coefficients
Psychiatric conditions			λ = 0.86
0 disorder	802	616.76	1.30
1 disorder	369	533.16	0.69
2 disorders	157	230.44	0.68
3 disorders	79	66.40	1.20
4 disorders	29	14.35	2.02
5 disorders	19	2.48	7.66
6 disorders	8	0.36	22.38
8 disorders	1	0.005	209.66
Medical conditions			λ = 1.18
0 disorder	467	449.50	1.04
1 disorder	498	530.77	0.94
2 disorders	297	313.36	0.95
3 disorders	135	123.34	1.09
4 disorders	50	36.41	1.37
5 disorders	15	8.60	1.75
6 disorders	1	1.69	0.59
7 disorders	1	0.29	3.50

λ = mean multimorbidity coefficient in the sample.

disorders. Fewer persons than expected had only one or two psychiatric disorders, leading to multimorbidity coefficients (observed/expected) lower than one. Most of the psychopathology was concentrated in fewer individuals, as evidenced by increased coefficients. On the other hand, somatic conditions seemed to be more evenly distributed, with coefficients close to unity. The observed number, expected number, and multimorbidity coefficients for medical illnesses and psychiatric disorders were also inspected graphically (data not shown). Neither the medical illnesses nor the psychiatric disorders were randomly distributed; instead they were concentrated in a minority of individuals (medical illnesses, LR test *vs* Poisson: $\chi^2_{(1)} = 8.65$, $P < 0.03$; psychiatric disorders, LR test *vs* Poisson: $\chi^2_{(1)} = 219.7$, $P < 0.0001$).

Individuals with any one of 15 psychiatric conditions also had higher rates of psychiatric multimorbidity compared with individuals without psychiatric conditions, showing that the presence of a single disorder increases the likelihood of occurrence of another mental disorder (Table 2). The highest RR values were obtained for depression (RR = 5.1; 95%CI = 4.5-5.7), dysthymia (RR = 4.9; 95%CI = 3.9-6.2), substance use disorder (RR = 4.7; 95%CI = 2.7-8.0), and obsessive-compulsive disorder (RR = 4.7; 95%CI = 1.6-13.5). Many psychiatric conditions were associated with medical multimorbidity: cognitive impairment, nicotine dependence, somatoform disorders, and dissociative disorders. It is worth mentioning the association of chronic medical multimorbidity with anxiety and depressive conditions: depression, dysthymia, any phobia, and generalized anxiety disorder. Categories such as panic attacks, obsessive-compulsive disorder, bipolar disorder, bulimia, alcohol and substance use disorders showed no association with medical multimorbidity. Similarly, individuals with chronic medical illnesses also showed higher rates of the other seven conditions ($P < 0.0001$). Significant associa-

Table 2. Association of psychiatric and chronic medical conditions with psychiatric and medical multimorbidity in a general population sample from the Epidemiologic Catchment Area Study of São Paulo (ECA-SP) (N = 1464).

Morbidity	Psychiatric multimorbidity		Medical multimorbidity	
	RR	95%CI	RR	95%CI
Psychiatric conditions (N)				
Cognitive impairment (20)	2.1	1.2-3.7	1.8	1.3-2.5
Non-affective psychosis (31)	3.4	2.3-5.0	1.1	0.8-1.5
Panic attacks (48)	4.1	3.1-5.6	1.1	0.8-1.4
Generalized anxiety (56)	4.4	3.4-5.8	1.4	1.1-1.7
Any phobias (136)	4.6	3.9-5.3	1.2	1.1-1.4
Obsessive-compulsive disorders (4)	4.7	1.6-13.5	1.4	0.6-3.2
Depression (247)	5.1	4.5-5.7	1.1	1.0-1.3
Dysthymia (64)	4.9	3.9-6.2	1.6	1.3-1.9
Bipolar disorder (13)	4.3	2.4-7.7	1.5	1.0-2.4
Bulimia (21)	3.3	2.1-5.4	1.4	1.0-2.0
Alcohol use disorder (74)	4.2	3.4-5.3	1.0	0.8-1.2
Substance use disorder (15)	4.7	2.7-8.0	1.0	0.6-1.7
Nicotine dependence (338)	4.1	3.6-4.7	1.2	1.1-1.3
Somatoform disorder (84)	3.7	2.9-4.6	1.3	1.1-1.6
Dissociative disorder (36)	3.6	2.5-5.2	1.5	1.1-2.0
Medical conditions (N)				
Back pain (446)	1.1	0.9-1.3	2.7	2.4-2.9
Hypertension (379)	1.2	1.0-1.4	2.9	2.6-3.1
Asthma (349)	1.9	1.6-2.2	2.3	2.1-2.6
Headache (319)	1.2	1.0-1.4	2.6	2.4-2.9
Heart problems (122)	1.2	0.9-1.6	2.4	2.1-2.7
Diabetes (113)	1.1	0.9-1.5	2.3	2.1-2.7
Stroke (29)	1.3	0.8-2.1	3.2	2.6-3.9
Cancer (28)	0.7	0.4-1.2	2.4	1.9-3.0

Data are reported as risk ratio (RR) indicating how many more disorders are present given the index psychiatric or chronic medical illness and 95%CI.

tions with psychiatric conditions were observed for asthma (RR = 1.9; 95%CI = 1.6-2.2) and a marginal association was observed with hypertension and headache (RR = 1.2; 95%CI = 1.0-1.4; P = 0.06). Having a psychiatric disorder was more associated with having multimorbidity chronic physical conditions than vice-versa.

Among the predictors of chronic medical illness and psychiatric multimorbidity (Table 3), gender appeared as a significant determinant, with females presenting more disorders of both types. Individuals in the 35-59-year age range were more likely to have both psychiatric and medical illnesses than the reference category (18-34-year-old subjects). For subjects aged 60 years and older, age increased the number of chronic medical conditions. Conversely, this age group presented a lower risk for psychiatric disorders. More disorders of either type occurred in separated/divorced or widowed subjects, while never married subjects had a negative association with chronic medical morbidity, probably attributable to an age effect, similarly to the finding of a lower risk among students for both types of morbidities. For chronic medical morbidities, those with a low educational level (0-8 years of education) presented a higher risk (RR

Table 3. Crude association of multimorbidity determined by negative binomial regression in a general population sample from the Epidemiologic Catchment Area Study of São Paulo (ECA-SP) (N = 1464).

Risk factors		Chronic medical illness		Psychiatric disorder	
		RR	(95%CI)	RR	(95%CI)
Gender					
Female/male	57.4%/42.6%	1.1	1.0-1.2	1.2	1.0-1.4
Age					
18-34 years	39.4%	1.0	-	1.0	-
35-59 years	42.2%	1.5	1.3-1.7	1.5	1.3-1.8
≥60 years	18.4%	1.9	1.7-2.2	0.7	0.6-0.9
Marital status					
Separated/divorced/widowed	16.7%	1.3	1.2-1.5	1.3	1.1-1.6
Never married	36.3%	0.8	0.7-0.9	1.1	0.9-1.3
Married/cohabiting	47.0%	1.0	-	1.0	-
Education (years)					
0-8	25.3%	1.4	1.2-1.5	0.9	0.7-1.1
9-11	13.9%	1.0	0.8-1.2	0.7	0.6-0.9
12-15	24.9%	1.0	0.8-1.1	0.7	0.6-0.9
≥16	35.9%	1.0	-	1.0	-
Employment					
Unemployed	2.2%	0.9	0.7-1.3	1.3	0.8-2.0
Student	5.4%	0.6	0.4-0.7	0.6	0.4-0.9
Retired/others	11.3%	1.3	1.1-1.4	1.3	1.1-1.6
Homemaker	11.9%	1.5	1.3-1.7	0.7	0.6-0.9
Employed	68.2%	1.0	-	1.0	-
Family income					
Top 25%	19.1	1.0	-	1.0	-
Middle 50%	35.4	1.1	0.9-1.3	1.0	0.8-1.2
Low 25%	45.5	1.0	0.9-1.2	0.8	0.6-0.9
Social class					
I	25.2	1.0	-	1.0	-
II	37.9	1.0	0.9-1.2	1.2	1.0-1.4
III	25.9	1.1	0.9-1.2	1.2	1.0-1.4
IV	3.8	1.1	0.9-1.5	1.1	0.8-1.6
V	7.2	1.0	0.8-1.2	0.7	0.6-1.0
Psychological distress (range 0-9)	Median 1.0	1.1	1.0-1.1	1.45	1.4-1.5

Data are reported as risk ratio (RR) indicating negative binomial association and 95%CI.

Table 4. Independent association of chronic medical illness multimorbidity determined by negative binomial regression in a general population sample from the Epidemiologic Catchment Area Study of São Paulo (ECA-SP) (N = 1464).

Variable	Chronic medical illness	
	Risk ratio	95%CI
Age 35-59 years	1.3	1.2-1.5
Age ≥60 years	1.7	1.4-1.9
Separated	1.2	1.0-1.3
Student	0.7	0.6-0.9
Education (0-8 years)	1.2	1.1-1.4
Psychological distress	1.1	1.0-1.1

Risk ratio with 95% confidence interval (95%CI) values indicates how many more disorders are present given exposure.

Table 5. Independent association of psychiatric multimorbidity determined by negative binomial regression in a general population sample from the Epidemiologic Catchment Area Study of São Paulo (ECA-SP) (N = 1464).

Variable	Psychiatric disorders	
	Risk ratio	95%CI
Age 35-59 years	1.2	1.0-1.4
Age ≥60 years	0.5	0.4-0.7
Retired/others	2.5	2.1-3.1
Psychological distress (female)	1.5	1.4-1.6
Psychological distress (male)	1.4	1.3-1.5

Risk ratio with 95% confidence interval (95%CI) values indicates how many more disorders are present given exposure.

= 1.4; 95%CI = 1.2-1.5). On the other hand, psychiatric morbidities appeared to be less frequent among those with an average educational level (9-11, and 12-15 years) and with a low family income (RR = 0.8, 95%CI = 0.6-0.9) and among unskilled manual workers (social class V; RR = 0.7; 95%CI = 0.6-1.0). Being retired or being a homemaker increased the risk of somatic morbidities (RR = 1.3; 95%CI = 1.1-1.4 and RR = 1.5; 95%CI = 1.3-1.7, respectively). These findings could be interpreted as age and gender effects. However, retired persons presented a higher risk of psychiatric morbidities (reverse causality), but homemakers were more protected from psychiatric problems, showing that this is a protective factor because there were no males in this category. The psychological distress score influenced both types of morbidities, being more intense in psychiatric (RR = 1.45; 95%CI = 1.4-1.5) than in medical conditions (RR = 1.1; 95%CI = 1.0-1.1).

The final negative binomial regression model for chronic medical morbidities showed that independent associations were determined by age (35-59 years and ≥60 years), being separated, having a low educational level, and the presence of psychological distress (Table 4). Being a student had a protective effect. Conversely, psychiatric morbidities were associated with retirement and psychological distress. Age was also a determinant, with the number of psychiatric disorders being higher for 35-59-year-old subjects, and lower for subjects aged 60 years or more. There was an interaction effect between gender and psychological distress, with the risk increasing to 1.5 for women and to 1.4 for men (Table 5).

Discussion

The main finding of the present study is that morbidity is concentrated in some socioeconomic groups and in psychologically distressed individuals of our sample, both for psychiatric and medical conditions. The presence of any disorder increased the risk of some individuals having another disorders of the same type.

Fewer persons than expected had one health problem only, and many more than expected had multiple morbidities. Major methodological differences (e.g., population, setting, type and number of diseases under study, type of multimorbidity determinants considered) preclude meaningful comparison of our results with the literature. However, our values of 34.1% for medical conditions and 20% for psychiatric disorders are consistent with previous reports. Examples are the rate of 29.7% for medical multimorbidity in the general practice setting found by van den Akker et al. (20), and of 6% for 12-month psychiatric comorbidity in the NCS-R (8). Recently, the pattern of comorbidity of major mental disorders (e.g., internalizing anxiety and depressive disorders, and externalizing disorders such as alcohol/substance use disorders and behavioral disorders) has been extensively explored through different multivariate techniques in large population-based data sets (23,24), underscoring the importance of this topic. This debate calls attention to the natural co-occurrence of psychiatric morbidities and may improve future schemes of diagnostic classification.

However, many determinants of multimorbidity have not been studied extensively, and research on the determinants of co-existing diseases using a broad nosological spectrum is scarce (2,8,20). Most investigations have focused on studying a small number of diseases in a restricted population, for example, only the elderly people or only patients admitted to hospital. However, it is difficult to draw a general conclusion from these investigations.

In the present study, the main determinants of physical multimorbidity were age (increasing number of disorders with increasing age), being separated/divorced or widowed, having a low educational level, and the presence of psychological distress. The results of our study agree with

the view that the number of co-occurring physical disorders in a person increases with age. For psychiatric disorders, multimorbidity was higher in the middle years, with lower rates in old age.

The comorbidity of medical and psychiatric disorders was not uniformly distributed among disorders, a fact that may indicate that different mechanisms underlie these associations. One possible mechanism of the psychiatric and medical comorbidity observed in the general population may be the over-reporting of physical symptoms in the presence of psychological distress. Although this phenomenon may have occurred regardless of the respondent's gender, it seems to correlate with the level of severity of the psychological distress, as described by Haug et al. (25) in the HUNT-II Study, where the connection between anxiety, depression, and functional medical symptoms in a large community sample was demonstrated.

For chronic and prevalent conditions, the traditional odds ratio approach overestimates the effect size because the real associations are confounded with the random chance that conditions will co-occur (5-7). The methodology we used to quantify the link between disorders (multimorbidity coefficient and RR by negative binomial regression) has the advantage of adjusting for the association by chance, as well as the ability to capture associations between two or more disorders. Apart from these spurious associations, we would like to highlight some common chronic medical illnesses and their link with psychiatric disorders found in our two-by-two comparisons of disorders. The association of asthma with anxiety, mood, substance abuse disorders, and dissociative and somatoform disorders is consistent with previous studies of population-based samples (26). Inner-city patients of low socioeconomic status with asthma may be at a particular risk for mental disorders. Feldman et al. (27) found a higher rate of association of psychiatric disorders with greater perceived impairment due to asthma in inner-city asthmatic patients, but not with an objective measurement of pulmonary function. This agrees with the information that only 13% of the subjects of our sample reporting asthma receive regular medical care due to the condition, in contrast to the high specialty care for those with more severe and burdensome disorders like cancer (54%; data not shown).

There is a widespread belief that heart disorders are associated with psychological stress, and particularly with depression and anxiety (28). In the present study, the heart disease was associated only with anxiety. Although anxiety has been described as a common trigger of angina, it seems that most of the association found in our study was due to the way heart disease was determined using self-reported measures. Assessing these symptoms by using solely the Rose Questionnaire may not reflect physical disease, but rather a tendency of anxious persons to report physical symptoms.

Hypertension has several determinants including psychosocial factors. There is some evidence linking depression and anxiety to hypertension (28). One possible mechanism could be the presence of increased levels of circulating catecholamine in people with anxiety or depression (29). A recent quantitative review concluded for a moderate support of the use of psychological factors as predictors of the development of hypertension, especially anxiety, depression, and anger variables (30). The association found in our study between current cognitive impairment, hypertension, and stroke may reflect the high prevalence of cardiovascular dementia in Brazil. The burden of cerebrovascular diseases is very high in Brazil, especially in women and in the low socioeconomic class (31).

Comorbidity between chronic pain and psychiatric disturbances is very common. The presence of depression and anxiety is frequently associated with chronic pain symptoms such as headache and lower back pain. Hagen et al. (32) reported that patients with chronic lower back pain present significantly more headache, migraine, anxiety, and depression compared with a reference population.

A possible limitation of the present study was the use of cross-sectional data that are not suitable to indicate the direction of causality. In addition, the pattern of comorbidity yielded by lifetime prevalence data involves some doubts. First, the pseudocomorbidity bias (33) may account for the effect of mixed-age samples on lifetime epidemiological assessments by creating the appearance of comorbidity even when disorders are randomly associated. Since the pattern of psychiatric and medical comorbidity in the present study was nonrandom and tended to cluster amongst few individuals, this pseudocomorbidity effect was unlikely to have affected our results.

The validity of self-reported medical conditions is of great concern. Physical morbidities relied on the unverified self-report of existing conditions, and therefore physical symptom reporting does not necessarily reflect objective disease. Although self-reporting of serious illnesses has shown good agreement compared to medical records (34), some kind of misclassification may emerge. The respondents' neuroticism-related styles of perceiving and reporting physiological experiences may bias the complaints of symptoms. One interpretation of our results may be that neurotic individuals share psychobiological characteristics that render them more vulnerable to develop physical morbidity, such as an unhealthy life style or deregulated stress-physiology (35,36).

In contrast to chronic medical illnesses, the present study could not demonstrate an association between low socioeconomic status and psychiatric multimorbidity, as pointed out in the literature. Probably, this effect was attenuated by the recruitment of the sample and by the socioeconomic characteristics of the area surveyed, which counts with many health services. Few unemployed people (1.6%) were selected in this sample. In addition, most of the residents in the area were of middle-upper socioeconomic

level. In the future, more inclusive sampling should be conducted to assess disadvantaged people living in more deprived areas.

Nevertheless, an important general finding of this study is that medical illness and mental disorders frequently co-occur even in a population sample of a developing country (37,38). The results suggest that substantial proportions of all morbidities in the community are not attributable to disorder-specific risks but rather to a few generic liability factors applicable to many disorders, both chronic medical and psychiatric ones. This has public health consequences since, regardless of the mechanisms underlying these associations, whether due to reporting bias or to causal chains, these persons seek health care in the primary care setting. People with common mental disorders, i.e., with a high level of negative affectivity, usually present more symptoms and physical complaints, and higher help-seeking behavior. Thus, these individuals are more likely to attend a health facility, thus overburdening the health services (37).

In line with the motives for conducting our analysis, the findings of the present study should also be integrated into the health-related agenda (38). Thus, in contrast to the somatic emphasis of the Millennium Development Goals (1,39), complaints are not always associated with physical abnormality, and similarly mild physical abnormalities can occur without symptoms. To conclude, it is important to bear in mind, as pointed out by Eisenberg (40), that "what brings patients to doctors is discomfort and dysfunction, not the pathology which may underlie them".

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